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IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ILLINOIS
EASTERN DIVISION

THE UNITED STATES OF AMERICA,	)	
	)	
Plaintiff,	)	
	)	
vs.	)	No. 78 C 1004
	)	
OUTBOARD MARINE CORPORATION AND MONSANTO COMPANY,	)	
	)	
	)	
Defendants.	)	

The deposition of ROBERT K. RINGER, called by the Defendant Monsanto Company for examination, pursuant to agreement and pursuant to the Rules of Civil Procedure for the United States District Courts pertaining to the taking of depositions, taken before Thea L. Urban, a Notary Public in and for the County of Cook, State of Illinois, and a Certified Shorthand Reporter of said State, at the U.S. Attorney's Office, 219 South Dearborn Street, 14th Floor Conference Room, Chicago, Illinois 60604, on the 22nd day of July, A.D. 1981, commencing at 10:00 o'clock a.m.

PRESENT:

MR. JAMES P. WHITE,
(Assistant United States Attorney
United States Attorney's Office
219 South Dearborn Street, 15th Floor
Chicago, Illinois 60604),

and

Thea L. Urban
Certified Shorthand Reporter
134 South La Salle Street
Chicago, Illinois 60603

PRESENT: (Continued)

MS. M. KAYE JACOBS,
(Water Enforcement Division
U.S. Environmental Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604),

and

MR. SEBASTIAN T. PATTI,
(Enforcement Division
U.S. Environmental Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604),

appeared on behalf of the United States of America;

MS. ROSEANN OLIVER,
(Phelan, Pope & John, Ltd.
30 North LaSalle Street
Chicago, Illinois 60602),

and

MR. JEFFREY C. FORT,
(Martin, Craig, Chester & Sonnenschein
115 South LaSalle Street
Chicago, Illinois 60603),

appeared on behalf of Outboard Marine Corporation;

MR. BRUCE A. FEATHERSTONE,
(Kirkland & Ellis
200 East Randolph Drive
Chicago, Illinois 60601),

appeared on behalf of Monsanto Company.

I N D E X

E X H I B I T S

- - -

(Witness sworn.)

R O B E R T K. R I N G E R,

called as a witness herein, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. FEATHERSTONE:

Q Are you Dr. Robert K. Ringer?

A Correct.

Q What is your present employment?

A I am employed at Michigan State University as a Professor of two departments. I am Professor of Animal Science. It has been changed.

I was originally appointed Professor of Poultry Science, but we have amalgamated Dairy Science, Poultry Science and Animal Husbandry into three departments and created the Department of Animal Science.

I am a Professor of Physiology and Coordinator of Toxicology in the Pesticide Research Center.

(Ringer-Monsanto Deposition Exhibit No. 1 marked for identification, 7/22/81, TLU.)

BY MR. FEATHERSTONE:

Q I have had marked as Deposition Exhibit No. 1,

Dr. Ringer, a multi-page document and I ask you what it is.

A This is a curriculum vitae that I prepared.

Q When did you prepare it?

A Roughly within the last year.

Q Does it reflect everything that you consider of importance currently in your background and professional background as a professor and author?

A It may be missing some of the very latest publications since it was prepared. It looks like at least a year ago.

Q The last publication that you have listed on Exhibit 1 is dated roughly July 1978. That would be the publication date, I take it, is that right, Entry No. 200?

A Yes. There are a number since that time, a goodly number.

Q Any of the publications authored since July of 1978, since the date of Entry No. 200 on Exhibit No. 1, do any of them relate to PCBs?

A Yes, they would.

I believe this was probably prepared as early as 1978.

Q This, you mean Exhibit No. 1?

A This exhibit we are talking about, Exhibit No. 1 .

Q Approximately how many articles have you published relating to PCBs since Exhibit 1 was prepared?

A There are presently three in press right now.

Q By in press, do you mean they have not been published yet?

A They have not been published yet.

Q Have any been published since July of 1978?

A Yes.

Q Do you have a copy?

A I have a copy of one with me. In fact it would be more than one, a 1980 publication. This was in press but not published.

MR. FEATHERSTONE: Off the record.

(Discussion off the record.)

BY MR. FEATHERSTONE:

Q Back on the record, Dr. Ringer, you have produced here five documents and I have broken them down into two groups: One, to reflect those that have been published and the second to reflect those that have not been published.

Would you mark these as Exhibit No. 2.

(Ringer-Monsanto Deposition Exhibits Nos. 2-A and 2-B marked for identification, 7/22/81, TLU.)

BY MR. FEATHERSTONE:

Q Dr. Ringer, I have had marked as Exhibit 2-A and 2-B two documents, both of which are dated 1980, which you produced here this morning.

Are these the only two documents you have published since the preparation of Exhibit No. 1 that relate to PCBs?

A To the best of my knowledge, yes.

(Ringer-Monsanto Deposition Exhibits Nos. 3-A, 3-B and 3-C marked for identification, 7/22/81, TLU.)

BY MR. FEATHERSTONE:

Q Doctor, I have had marked as Exhibits 3-A, 3-B and 3-C three documents which you have produced this morning.

Are these documents that have not yet been published but have been submitted for publication?

A That is correct.

Q Have they been accepted for publication?

A All three are accepted for publication.

Q Are these, to the best of your knowledge, the only three documents which you have prepared for publication and which have been accepted for publication but have not yet been published?

A That is correct.

Q Are there any documents that you have prepared for publication and have submitted but have not had accepted yet since July of 1978?

A I don't believe so. This is a complete list.

Q Doctor, on Exhibit 1 you have listed as one of your three titles Coordinator of Toxicology, Pesticide Research Center.

First of all, where is the Pesticide Research Center located?

A On the Michigan State University Campus.

Q Is it part of the University?

A It is a Center as part of the University. It is not a degree-granting organization. It is a research center.

Q Can I take it from its name that it is a research center specializing in pesticides?

A The title is called Pesticide Center. The Center has taken under its new director a broader

approach in looking at environmental pollutants as well.

Q Has the Pesticide Research Center done any work on PCBs?

A As members, individuals have, yes. For example, my own work has done or has dealt with and Dr. Zabik, Z-a-b-i-k, Dr. Matthew Zabik.

Q He is an analytical chemist, is he not?

A He is an analytical chemist; Dr. Richard Leavitt, L-e-a-v-i-t-t, is also an analytical chemist. They both work together on analytical chemistry.

Q Does the Pesticide Research Center sponsor work?

A They do not fund research.

Q Your research on PCBs, is that work that you have done under the auspices, if you will, of the Pesticide Research Center?

A I started long before that, before the appointment to the Pesticide Center.

Q How about your present work in the PCBs? Is that under the auspices of the Pesticide Research Center?

A My major appointment is 50 percent in the Pesticide Center. Therefore, I must say it is partly done under the auspices of it, but it is also done under the Animal Science. The animals are housed under the Animal Science Department and under their control.

Q Dr. Zabik and Dr. Leavitt are analytical chemists, is that correct?

A That is correct.

Q Is their work on PCBs support work to someone like yourself?

A Yes.

Q Who else at the Pesticide Research Center is doing work of a type similar to yours on PCBs?

A No one, to my knowledge.

Q Your title is Coordinator of Toxicology. What are those duties?

A The role of the Center is organized with a director and four positions as coordinators. We have a Coordinator of Analytical Chemistry, which is Dr. Zabik. We have a Coordinator of Environmental Transfer and I am Coordinator of Toxicology, and Dr. Matsumori, who is a director also, is filling in as the Director of Metabolic Studies.

Q I am interested in what you do as Coordinator of Toxicology.

A As a Coordinator, we are supposed to meet with other departments and try to help foster research done and to bring it into the Center as part of the Center and see where the Center can help coordinate

through either the use of the analytical ability or the use of animals.

Q Are you in essence a clearinghouse of information for the University as to what types of toxicological projects are going on?

A No. We have a Center for Environmental Toxicology as well.

Q Which is different?

A Which is the clearinghouse, yes.

Q Different from the Pesticide Research Center?

A That is correct.

Q What is the name of that group again?

A Center for Environmental Toxicology. Dr. Jerry Hook is the Director there.

Q Do you have any position with the Center for Environmental Toxicology?

A It is a relatively new organization and we are all on the faculty that are interested in toxicology being brought into the Center.

This Center is to act as a clearinghouse to the State of Michigan, to the public on questions on toxicology.

Q But you have a position with the Pesticide Research Center. My question is do you have a position

with the Center for Environmental Toxicology?

A Not an appointment.

Q What is the breakdown and the jurisdiction, if you will, of the Center for Environmental Toxicology and the Pesticide Research Center?

My question is this, Doctor: I take it they have two different focuses, if you will.

A Correct. This is research.

Q The Pesticide Research Center is?

A Research-oriented.

Q And the Center for Environmental Toxicology, is that also research?

A It is going to be instructional and for public information.

Q Is the Center for Environmental Toxicology then the clearinghouse for information?

A Yes, that is correct.

Q You are not a toxicologist, are you, Doctor?

A I am now so labeled. I was trained as a physiologist and biochemist.

Q Do you have training in toxicology?

A One cannot really describe exactly what a toxicologist is. The training comes through pharmacology, physiology, biochemistry, pathology.

I am considered a toxicologist on campus.

Q You have no degrees in toxicology, is that correct?

A That is correct.

Q So to the extent you have an expertise in toxicology, it is by way of your background?

A Correct.

Q By that, I mean the types of projects you have worked on for how many years that you have been a professor?

A Since '64, Full Professor since '64.

Q In your position as Coordinator of Toxicology, are you involved in the review of proposed toxicological projects at the University?

A No, not as such unless the individual comes to me and asks me to review it, which does occur.

Q As a Professor in the Department of Physiology, what are those duties?

A That is my --

Q Teaching appointment?

A Teaching appointment, correct -- no, I am listed as Research there, I am sorry, but I am teaching a course.

In order to teach a physiology course at

Michigan State University, you must be a member of the Department of Physiology and I teach an Avian Physiology course.

Q Do you teach any courses that involve human toxicology?

A For the past two years, I have been the coordinator of a course entitled Introduction to Environmental Toxicology, which we have students from the Animal Sciences area, physiology, biochemistry, animology, civil engineering.

They come from many of these departments.

Q I am not sure I got an answer to my question.

A It is a basic introductory course.

Q You teach a basic introductory course that is called roughly Introduction to Environmental Toxicology?

A Yes.

Q Now, my question was whether you had a teaching appointment that involves human toxicology.

A No.

Q This course which you describe as the Introduction to Environmental Toxicology, is that taught to undergraduates?

A It is a 400 level course in which seniors are taking the course and there are some graduate students.

Q I am not sure what a 400 level course means. Can a freshman take that course?

A A freshman could take it. It certainly would not be advised because the prerequisites for it include biochemistry, which they would not get in their freshman year.

The course is a blend of graduate students and undergraduate students.

Q I take it graduate students in the course are specializing in other fields and taking the Introduction to Environmental Toxicology as kind of a side course?

A Yes.

Q Your appointment as Professor in the Department of Poultry Science, which I think you have now characterized as the Department of Animal Science --

A Yes.

Q -- what are your duties there?

A Research and teaching.

Q Insofar as these three appointments are concerned, is your principal appointment or the principal focus of your activities in the Department of Animal Science?

A I am housed in the Department of Animal Science. My appointment is 40 percent of my effort within that

department, so that my split is 50 percent in Pesticide Center, 40 percent in the Animal Science Department and 10 percent in the Physiology Department with an 85 percent research appointment and a 15 percent teaching appointment.

Q Going back for a second to the teaching appointment in the Department of Physiology, if I understood your testimony correctly, you share the teaching responsibilities for that one course, is that correct?

A The Introduction to Environmental Toxicology, yes.

Q How many professors are involved in teaching that course, and when I say professors, I don't mean in the technical sense. I mean how many other teachers are involved in that course?

A Approximately five.

Q I take it you split up the responsibilities by background?

A Correct.

Q What portion of that course do you teach?

A I teach the animal toxicology portion.

Q I take it to the extent the course in an Introduction to Environmental Toxicology concerns human toxicology, that is taught by someone else?

A The Pharmacology and Toxicology Department teaches the course which is more directed towards human application, which we hope students will take this course first and then go into that course.

Q That second course is the course on human toxicology, loosely labeled?

A Yes.

Q You do not have any involvement with that second course?

A No.

Q Do you have any PCB research presently under way?

A No.

Q On several of your articles, there has been reference made to a fellow by the name of Dr. Aulerich.

A We pronounce it Ullrich.

Q Dr. Aulerich. What is his appointment?

A He is Professor in Animal Science.

Q He has the same teaching appointment as you do in that respect?

A He does no teaching.

Q He is all research?

A Research and extension. He is 75 percent research and 25 percent cooperative extension.

Q Is he presently doing any PCB research?

A No.

Q Do either you or Dr. Aulerich presently have any PCB research being conducted under your supervision?

A We have papers in the process of being prepared on PCBs.

Q Those papers that are being prepared are being prepared by people in your department?

A They are being prepared by students that have worked with the two of us.

Q I take it the papers those students are preparing are papers based on their own research?

A Cooperative research.

Q What is cooperative research?

A Dr. Aulerich and I are directing the research.

Q So you do have --

A Graduate students under us.

Q You are presently supervising ongoing PCB work?

A Not at this exact moment. It has been completed and the papers are being prepared.

Q How many papers are being prepared?

A I can think of at least two.

Q When these papers are finalized for submission for publication, I take it that is the goal?

A That is the goal.

Q Is your name going to be on the papers?

A Yes.

Q I hate to do this, but let us label this for the present time Paper 1 and Paper 2.

What is Paper No. 1 about?

A I am hesitating in the answer because the work was done by an exchange foreign scientist that visited with me and did the work while in the United States. He has now returned to his country, his home country, and is preparing the papers.

They are dealing with the effect of PCBs on the metabolism of the hormones from the thyroid and estrodile from the ovary.

Q In which animal?

A In the mink.

Q You just said he is preparing papers. Is this fellow preparing both Papers 1 and 2?

A That is correct.

Q Who sponsored this research?

A This research was conducted under moneys that I had obtained.

Q From whom?

A Can I say this off-the-cuff for a moment?

Q You can answer the question this way. You can tell me if it is the Government. If it is not the Government, you can tell me if it is private sources.

If you still want to go off the record after that clarification, we can go off the record.

A Partly a combination of both since the moneys were there in a pool and we pulled on the different sources. We did not have any specific money to do this research with, which is why I hesitated in the answer, so it is done somewhat --

Q Is there some Government money involved in this research?

A Yes, there would have been some.

Q Which Government or which Government agency gave you the money for that research?

A This would be both EPA and I believe, I would think there would be some dollars from USDA.

Q The money that you said came from EPA, that is US EPA?

A That is correct.

Q And was that money that was given to you for general use? You said it was not directed to a specific project as such.

A It was given to us to do PCB research with.

Q With respect to the money given to you by the USDA, was that money also given to you to do PCB research?

A To do mink research.

Q Were there any limitations on what type of mink research you could do with the USDA money?

A No. Some of the dollars could have been from the Mink Farmers Research Foundation, which also supports our mink research.

Q Where is that Research Foundation located?

A It is officed or was officed in Wisconsin.

Q It used to be in Milwaukee, I think, wasn't it?

A No, a small town in Wisconsin. I believe it is Thiensville.

Q That doesn't ring a bell with me.

A I do not believe I have the exact address with me at this time.

Q Do you receive money on an annual basis from the US EPA for your research?

A No.

Q How often do you receive money from the US EPA?

A I believe I have had EPA money on two different

occasions.

Q Let us take the last one first. Do you fill out a grant application for the US EPA money?

A I filled out a form, yes.

Q And this money was used in the most recent research that was under your supervision, I take it? That was grant money you got from the US EPA after you filled out a form?

A Yes, that is correct.

Q Do you have that form someplace?

A The exhibit.

Q They are out for Xeroxing.

The US EPA publication that is Exhibit 2-A to your deposition, does that have the grant form or the grant application form in the back?

A No, but it does have a statement in the back.

Q What does the statement show?

MR. WHITE: If you recall.

BY THE WITNESS:

A I do not recall.

BY MR. FEATHERSTONE:

Q In filling out those statements, did you have to fill out the purpose for the research?

A Yes.

Q Is there any work presently being done at Michigan State that is a feeding study of Great Lakes fish to mink?

In other words, is it a study similar to the first one you did back in the late '60s?

A Not under my direction, but I believe Dr. Aulerich is directing some work that is being done on feeding fish.

Q To mink?

A Yes.

Q Are you in any way involved in that research?

A Yes, I am.

Q In what way?

A I believe I am listed as an investigator because it is reported through the Sea Grant, the Michigan Sea Grant Program through the State of Michigan and Michigan State University.

Q You say you are listed as an investigator. What does that mean?

A I am not the principal investigator.

Q Is investigator another word for researcher?

A Yes.

Q Did you have any involvement in the development of that study?

A Yes.

Q Would you describe for me what your involvement with the study is?

A My involvement was in the original planning of the research with Dr. Aulerich. We consulted together. We are officed in the same suite of offices and we consult together regularly on the research.

Q When you say you are involved in the planning of research, I take it that includes what type of fish you were going to feed to the mink and for how long and in what quantity?

A That is correct.

Q Has that research been finished?

A No, it has not.

Q When is it due to be finished?

A I believe the graduate student is in the last portion of the research right now.

Q When you say last portion of research, what does that mean?

A I believe the mink are going to be terminated on the study July, roughly around the first portion of July, which we are in right now.

Q Was it a six-month feeding study?

A I believe it is longer than that.

Q When did the study begin?

A Approximately two years ago; therefore, I must qualify my previous answer that this is work directed toward getting at the PCB problem that is ongoing.

Q Which fish were selected for use as feed?

A We have been looking over the last several years at some of the fish meals and products coming from the Great Lakes to see if we can use them again as food sources for the mink industry.

Q I understand that, but which fish did you use as fish meal in this study?

A I do not exactly know right now.

Q Did you use more than one species?

A Yes.

Q How many species of fish did you use or did you select, I guess is the word?

MR. WHITE: If you recall.

BY THE WITNESS:

A I do not recall how many.

BY MR. FEATHERSTONE:

Q Did you use the coho salmon?

A No, not to my knowledge.

Q Did you consider using coho salmon?

A No, I do not believe so.

Q Why not?

A Primarily because we have considerable amount of research done on the coho.

Q The research you are referring to is the research that was done in the late '60s or early '70s?

A Correct.

Q And you did not think it was necessary to do any subsequent research in use of coho salmon as a feed source for mink?

A Our interest was in looking at some of the other species, one of which I do know was the alewife.

Q Doctor, when I was reviewing the work of yours to which I had access, which does not include the five documents which you produced this morning, I notice that you fed mink with coho salmon that was caught in '68 and '69 and none caught later than that, is that correct?

A I believe '67, '68.

Q But the best of your recollection, no coho salmon caught after 1968?

A Could also be 1969.

Q Does the present feeding study being done at the Michigan State University include lake perch or yellow perch?

A I do not recall.

Q Does the study at Michigan State University now ongoing include feeding of mink with bloater chubs?

A I also do not recall.

Q Does the feeding study at Michigan State University ongoing include the feeding of trout to mink?

A Not to my knowledge.

Q Is the trout considered as a possible source?

MS. JACOBS: You are referring to a particular species of trout?

MR. FEATHERSTONE: Trout, period, any species of trout. That is why I did not say lake trout or rainbow trout or brown trout.

BY THE WITNESS:

A I do not recall that we were considering using any trout.

BY MR. FEATHERSTONE:

Q Any species of trout?

A No.

Q We are on the same wave length.

A Yes.

Q Because of Ms. Jacobs' suggestion, did you consider using any other species of salmon other than coho salmon in your feeding study?

A Not to my knowledge.

Q In one of your recent answers, you interjected that you remembered alewives was selected as fish for uses of feed to mink in this present study.

A That is correct.

Q Any other species of fish that you can remember?

A Not specifically.

Q Is the purpose of the study that is now being done at Michigan State to determine whether fish caught out of Lake Michigan and processed by feed manufacturers could be used as a fish feed source to mink?

A That was the purpose of the study.

Q Does the program that is now going on at Michigan State involve any analytical work to determine the levels of PCBs to be used in the fish feed that is being used?

A Not that I am involved in.

Q I am not quite sure I understand your answer. The study I am asking you about is the study that is being done under Dr. Aulerich in which you were involved in the planning.

A Sorry, I misinterpreted your question.

Q Fine. The series of questions that I asked you about the species of fish being used, you understood

my questions to relate to this study that Dr. Aulerich is supervising and which you were involved in the planning?

A Yes.

Q I am still on that study.

A I'm sorry. I was looking for whether you were asking the question of whether other people were looking at fish from the Great Lakes.

Q No, I am sorry.

The study that is now ongoing at Michigan State, is there analytical work being done to determine the level of PCBs in the fish that is being fed to mink?

A Yes.

Q Is that work being done by Dr. Zabik?

A It is being done in the Pesticide Research Center under his direction but by a graduate student that is working with Dr. Aulerich.

Q Is the analytical work that is being done in this project to determine the level of PCB in the fish?

A Yes.

Q Does it also determine the chlorination of the PCB in the fish; in other words, whether it is Aroclor 1242 or 1248 or 1254 or like Aroclors?

A I believe he is looking at the total area under

the curve and not for any one specific Aroclor.

Q So the analytical results are going to show total parts per million concentration of PCB?

A That is correct.

Q And there will be no breakdown of 1242, 1248, 1254, 1260?

A Not beyond the fact that he must run some standards in which to check the gas chromatograph against.

Q In order to determine that something is in fact a PCB?

A That is correct.

Q Were you involved in the decision to look only for the total amount of PCB rather than break it out according to the particular chlorinated PCB?

A It is rather difficult to specifically say when you analyze a fish that this is all exactly 1254 or 1248 or 1242 because you have additional peaks in there that makes it difficult.

In other words, they do not mimic the exact standard that you put into the gas chromatograph.

Q The weathered PCB sample, if you will, doesn't look identical to the chromatograph of the commercial sample, is that what you are saying?

A I am questioning the word weathered. The one

that has been taken from an animal where it is passed through the intestines and metabolized in some way.

Q That is how you understand it is different from a commercial?

A It may be somewhat different from a commercial standard.

Q What you are telling me is it is hard to characterize a PCB you find in a fish as 1242, a 1248, a 1260?

A In general you can, but if there are some additional peaks there, you would not want to say specifically that it is only 1254 and absolutely nothing else unequivocally.

Q Was the analytical difficulty the reason why a decision was made not to try to break out the total PCB content of the fish fed according to the degree of chlorination of PCBs?

A Basically, yes.

Q You are aware, Doctor, are you not, that other researchers have indeed made an attempt to break out total PCBs into the various Aroclors?

A As you stated, an attempt to do it, yes.

Q In view of your earlier research in which you found different effects on mink from the different

chlorinated PCBs, why was it then with that research you didn't decide to break out, attempt to break out by your best analytical efforts, the various chlorinated PCBs?

A I am not sure I am interpreting your question so that I can answer it. Could you restate it?

Q Earlier research, Doctor, and correct me if I am wrong, has shown that the different chlorinated PCBs have different effects on mink.

A Somewhat, yes.

Q I will accept that answer for the time being.

In light of that, why wasn't an effort made or why isn't an effort being made to break out PCBs that you are now feeding the mink through the fish into the various chlorinated PCBs?

A In that in my experience, many of them have looked like 1242 to 1254 and since those compounds differ only slightly in their effect upon the mink, I am not sure it was necessary to look at the individual ones.

MR. FEATHERSTONE: Thea, could you read back his answer?

(Answer read.)

BY MR. FEATHERSTONE:

Q Doctor, in 1977 you published a report entitled "Current Status of PCB Toxicity to Mink and Effect on Their Reproduction."

A That is correct.

Q In that report, you set forth the results you obtained in feeding mink two parts per million of 1016, 1221, 1242 and 1254.

A That is correct.

Q Have you, Doctor, done any other feeding studies involving mink and involving Aroclors 1242, 1221 and 1016?

A We have done additional work on Aroclor 1016 and 1242, but not on 1221. They are part of the exhibits that were presented this morning.

Q The additional work that you have done on 1242, that has been published. It is one of the exhibits this morning, I know, but when did you publish the work?

A It is the one that was published in 1980.

Q Was that for the EPA?

A No, it was not.

Q This study at Michigan State University that is now ongoing, is it only a study that involves the feeding of fish to mink -- let me restate the question.

I understand that mink feed involves a

variety of different animals. I take it that what is of concern to you is the fish portion of the diet because that is the portion that might contain PCB, is that correct?

A That is correct.

Q The ongoing study at Michigan State University, does that involve any direct application of a commercial PCB preparation to the food?

A No, it does not.

Q So to the extent PCBs are involved, it is through the fish portion of the diet?

A Yes.

Q What portion of the diet being fed to the mink in the study is fish?

A I believe we were targeting for the equivalent of 30 percent fresh fish, but since portions of these studies were fish meal, they were dried and therefore they have to be reconstituted with water to bring them up to a wet weight.

Q Your earlier studies, and by earlier studies I am talking now about the one back in the late '60s, fresh fish comprised 30 percent of the diet fed to the mink?

A Yes.

Q I take it none of that was fish meal as such?

A No.

Q So the present study at Michigan State University involves both a diet similar to the one you gave back in the late '60s and also a fish meal diet that is diluted?

A I am not sure whether there are any fresh fish in the present study other than the controlled diet would be.

Q I want to get away from the controlled diet for a second.

Tell me what the controlled diet is in this study, the one that is ongoing at Michigan State University.

A I could not give you the formulation offhand. The controlled fish would be an ocean fish.

Q And that controlled fish would be a certain percentage of the total diet?

A Yes.

Q I take it that would be about 30 percent?

A Yes.

Q Are you feeding a controlled group with fish meal, say, ocean fish meal?

A I believe so, but I would not be absolutely

sure. Our purpose in this study was to, as I stated earlier, see if we could render the fish taken from Lake Michigan or that could be taken from Lake Michigan as an edible product for mink.

Q Who is sponsoring the research?

A That is being sponsored by the Michigan Sea Grant.

Q Oh, that is right.

Is there a target date for preparation of a final report?

A A report is due within approximately one month, but this will not be a published report, to my knowledge.

Q Who are you submitting the report to?

A It goes to the Sea Grant office.

Q Who is the fellow who is responsible for receiving the report from you?

A I presume it will go first to Al Beeton's office at the University of Michigan.

Q Is that B-e-a-t-o-n?

A B-e-e-t-o-n.

Q Who is he?

A Al Beeton is the Director of the Michigan Sea Grant Program.

Q Does he have a teaching appointment at Michigan

State?

A I do not know.

Q Are you familiar with the results of this study, the ongoing study at Michigan State?

A Not in all details.

Q Are you familiar with the results in any detail?

A Not at this point to be able to state the results because the animals are just finishing.

It is just a little too early for me to answer that question.

Q I take it when the research is done, you are going to review the results?

A Definitely.

Q I take it the results of the research that is now ongoing at Michigan State will form a basis for whatever opinions you give about Lake Michigan fish?

A That would be correct.

Q By the way, are the fish that are being fed in this study at Michigan State, Lake Michigan fish?

A I believe they all are.

Q The two-year time period of the study, how was that determined?

A Basically it is what we thought we could

accomplish within that period of time to go through two years of feeding mink.

Q Two different years of reproduction?

A Yes. And that was the goal, to look at the effects upon reproduction and growth and survival of the offspring.

Q Where were the fish obtained in the study?

A Dr. Aulerich obtained the fish and I could not cite the exact source.

Q Was there any effort to be any more selective in your selection of fish other than to make sure they were from Lake Michigan?

In other words, did you focus on fish caught in a particular part of Lake Michigan?

A No. I believe we were limited in where we could get fish from at the time we wanted to start this.

Q How were you limited?

A There aren't that many plants processing fish that we could use.

Q In your study?

A In our study.

Q I take it the ongoing study at Michigan State University makes no attempt to be selective in respect to fish caught in a particular part of the Lake?

A That is correct.

Q What was the criteria used to determine what species of Lake Michigan fish to use in the study, and I realize you cannot remember now species, what those species of fish are, but you must have had some criteria.

A The original goal as requested as to look at the extraction of portions of the fat, and therefore, I believe we were looking for a range of fish over a range that had different fat content in the fresh fish.

Basically, for example, the alewife is fairly fatty and the bloater chub is a fairly fatty fish and less in general than the perch.

Q Was the criteria to use the fatty fish?

A No, I believe we were looking at a range of several of these so that we looked at different ranges of fat.

Q So you were looking at fatty fish, fish with medium fat levels and lean fish?

A Yes, that was the original intent in our discussions.

Q The ongoing study, are you feeding the mink ground whole fish? In other words, was there any effort to trim away what you call the by-products?

A No, we did not prepare the meal. These were

commercial meals.

Q Did you make any investigation to see how the commercial preparer prepared the fish meal?

A No, we did not.

Q So you don't know whether there was any trimming that went on?

A No.

Q And, of course, trimming of a fish before preparation would affect PCB levels?

A That would be correct.

Q You said you are testing fish meal. I don't know anything about fish meal. What is it?

A Fish meal is a dehydrated fish product.

Q Sold to mink farmers among others?

A Fish meals are sold from various sources to various animal industries. Poultry users have used a lot of fish meal.

Q I want to focus on mink.

A Okay.

Q I take it there are businesses in the Great Lakes area that prepare fish meal that are offered for sale or could be bought by mink ranchers?

A That is correct.

Q And that is why you are doing this study?

A Yes.

Q How does the mink rancher use the fish meal in preparing a diet for the mink?

A It would be incorporated in the diet and then water added to it to bring it up to a palatable consistency. The industry has been for a number of years trying to move away from feeding fresh frozen ground meat as their sole diet. They are going to what we call dry diets.

The researchers, the feed companies have been producing a pellet-type feed that is made up of meat products, dehydrated meat products, dehydrated poultry, dehydrated fish, into which they incorporate into this pellet and then feed to mink.

Q If a mink rancher buys dehydrated fish meal, adds water to it to get it to a palatable composition, is that all the mink is fed?

A No. He would have other products in the diet, cereal grains.

Q Meat?

A Probably some meat, trimmings from the slaughter industry.

Q I take it it is the water-added fish meal that makes up 30 percent of the diet you are feeding to mink

in this ongoing study at Michigan State?

A Yes.

Q In this ongoing study, is there any effort to limit the water-added fish meal to, say, 15 percent of the diet?

A Not to my knowledge.

Q So each of the test groups is receiving 30 percent of its diet as fish meal?

A I believe 30 percent is the figure.

Q Doctor, in any of the PCB work that you have done with mink, have you varied the percentage of diet that is fresh from 30 percent? Have you ever tried 15 percent or 20 percent or 10 percent?

A I believe we have used 30 percent all the way through our study. The commercial industry does vary the percentage of fish all the way up to -- I've heard figures as high as 65 percent of the diet being composed of fish.

Q When you say the commercial industry, what do you mean?

A The mink industry out in the States, Michigan, Wisconsin, Minnesota.

Q Are these mink ranchers you are talking about?

A Mink ranchers, yes.

Q Are there mink ranchers today who are using Great Lakes fish in the diet for their mink?

MR. WHITE: If you know.

BY THE WITNESS:

A I know of only one that had been called to my attention that has been interested and has been using a limited quantity of a fish meal.

BY MR. FEATHERSTONE:

Q The limited quantity of the fish meal, is that Lake Michigan fish?

A Yes.

Q How limited?

In other words, what percentage of the diet?

A This I do not know. I do not think he uses it throughout the entire year.

Q You testified this is the only mink rancher who has been brought to your attention.

Have you made any independent effort to determine if there are independent mink ranchers out there using Lake Michigan or Great Lakes fish as any portion of the diet?

A No, I have not.

Q Have you made any effort to follow the breeding

results or growth results that this mink rancher has experienced as a result of using Lake Michigan fish in a portion of his diet?

A I have not. Dr. Aulerich has been the one who has been contacting this individual.

Q Who is this individual?

A That I could not give you. I do not know the name.

Q Where is he located?

A It is not in the State of Michigan. I believe it is Illinois.

Q Do you know where in Illinois?

A No, I do not.

Q When you testified that certain mink ranchers have used up to 60 percent of the diet as fish, when is that?

A Mink ranchers generally buy the products when it is economically feasible to feed them. The case where I heard of as high as 65 percent came out of England where a mink rancher stated to me that he had fed up to 65 percent of his diet as fish.

Q I want to focus on mink ranching in the Great Lakes Basin.

What is the range of percentage of diet

that mink ranchers in that Basin use as fish?

A I don't keep up with that. Dr. Aulerich is the mink expert from the commercial industry side and I rely on him.

Q You mean is Dr. Aulerich who is aware of what is going on among mink ranchers?

A Yes.

Q What they are doing?

A Yes.

Q And you rely for your information, whatever information you have on information passed along to you by Dr. Aulerich?

A Through Dr. Aulerich, that is correct.

MR. WHITE: With respect to the commercial industry?

THE WITNESS: With respect to the commercial industry, yes.

BY MR. FEATHERSTONE:

Q Let me get this straight.

When you say commercial industry, you are talking about the mink ranchers you find in Illinois and Michigan and those states?

A Yes, I am.

Q Do you have any plan to speak to Dr. Aulerich

and get yourself educated and find out what the mink industry is doing before you give testimony in this case?

A Could you restate that question, please?

Q Sure. Before you give testimony here in Chicago during the trial of this case, do you have any plans on talking to Dr. Aulerich about what he has learned about the commercial mink industry as you have described that?

A I can do that.

Q I am sorry?

A I can do that.

Q Do you have any plans to do that?

A I had not planned definitely to do that.

Q Have you been asked to educate yourself on the commercial mink industry?

A No.

Q Dr. Ringer, have you testified on PCBs in any trial or hearing in which your testimony has been transcribed?

A Yes, I have.

Q Where and when?

A I have been involved in three such cases.

Q When was the first?

MR. WHITE: Before we go into that area, could we

take a five-minute break?

MR. FEATHERSTONE: Sure.

(Brief recess had.)

BY MR. FEATHERSTONE:

Q Dr. Ringer, before we took a short break, I asked about your previous testimony on PCB and you reached into your bag and pulled out what appear to be three transcripts.

A Yes. The first case that I was involved in was the Bethlehem Mink Farm and that case was in Concord, New Hampshire.

Q What is the date on that?

A November 7, 1974.

Q Is that a deposition testimony or trial testimony?

A Trial.

Q By the way, the three transcripts you produced here, are these your only copies?

A They are my only copies, yes.

MR. WHITE: We can have them reproduced.

MR. FEATHERSTONE: Fine.

BY MR. FEATHERSTONE:

Q Did you testify for the plaintiff in this case; in other words, for the Bethlehem Mink Farm?

A Yes.

Q What is your second testimony?

A In the State of New York, Department of Environmental Conservation, and the General Electric Company.

Q When was that testimony, approximately?

A 1975.

Q The third, what was the third testimony?

A To the Environmental Protection Agency.

Q And that was in 1976 in Washington?

A October 14, 1976.

Q If I understand your testimony, Doctor, you have not testified since 1976?

A That is correct.

Q In 1976 you testified on behalf of EPA?

A Yes.

Q Have you been consulted by anyone as a possible witness in any trials or hearings since 1976 with the exception of this present case?

A I have been contacted by several lawyers, but never carried beyond that point. Either they dropped the interest or nothing ever happened.

Q Were you consulted or contacted by lawyers in connection with actual litigation, trials?

A No.

Q Have you given any depositions since 1976?

A No.

Q In 1976, Doctor, you prepared and submitted in this EPA hearing an affidavit. Do you remember that?

A In looking that over, yes.

(Ringer-Monsanto Deposition Exhibit No. 4 marked for identification, 7/22/81, TLU.)

BY MR. FEATHERSTONE:

Q Dr. Ringer, I hand you what has been marked as Deposition Exhibit No. 4. That is a multi-page document. The first page bears the number US 9223. It purports to be an affidavit that you signed in 1976 and submitted to the US EPA.

Is that in fact what it is?

A Yes, it is.

Q Who drafted the text of the affidavit?

A I did.

Q Did you submit a proposed affidavit to EPA for suggestions or revisions before you signed that affidavit?

A I do not recall.

Q Did you discuss the contents of the affidavit which is now Exhibit 4 with anybody from the Government

before signing it in 1976?

A I do not recall.

Q In your files in East Lansing, Doctor, would you have retained any communications or correspondence or earlier drafts of the affidavit?

A I do not know.

Q Are you a pack rat-type of guy who maintains very extensive files?

A Somewhat.

Q So you may well have something and you just don't remember it?

A That could be correct.

Q Now that I have shown you your earlier affidavit which was signed back in 1976, have you submitted any other affidavits on PCBs?

A No.

Q Since that time?

A No.

Q Did you submit any affidavits to anyone on PCBs before you signed Exhibit 4?

A Not to my knowledge.

Q Doctor, before I forget, I have a couple of wrap-up, clean-up questions.

The fish meal that is prepared by the

commercial companies that is made available for use by mink ranchers, what is the composition of the fish meal?

In other words, what fish are used?

A As I indicated earlier, I know one was an alewife fish meal.

Q That is a commercial preparation based on alewife?

A To the best of my knowledge.

Q Are there other preparers of fish meal who use species of fish other than alewives?

A I don't know.

Q You haven't made any effort to find out?

A No.

Q This study that is ongoing at Michigan State, is the fish meal being fed to the mink, is that entirely commercially prepared fish meal?

A That was.

Q In other words, there was no effort made by your department to prepare its own fish meal?

A No.

Q Did anyone in this ongoing study at Michigan State make any effort to determine what species of fish was ground up in this fish meal, other than what was being fed, the alewife?

A I don't know.

Q Was that part of the plan to determine that, was that deemed important?

A I don't recall right now.

Q Referring back for a minute to Exhibit 1 which is your curriculum vitae, there is attached a multi-page listing of publications which I assume are publications in which you had a hand.

There are, with certain of these publications, brackets or handwritten marks. Did you do that?

I think if you flip through the other pages you will see that.

A I do not recall.

Q During your lunch hour, would you please mark on Exhibit 1 all those articles that pertain to PCBs, to the best of your recollection?

A You are asking me during my lunch hour, to do this?

Q Yes.

A Yes, I would.

MR. FEATHERSTONE: You don't have any objection to him doing it that way rather than him sitting here now?

MR. WHITE: No, I don't.

BY MR. FEATHERSTONE:

Q When you make those marks, Doctor, would you make them other than as brackets in dark pen as somebody else did in your curriculum vitae?

A Yes.

Q Doctor, back on Exhibit 4, if you would look at the last exhibit to the affidavit which is a study on Aroclor 1016 that was done in 1976, it is listed as Exhibit F to your affidavit.

A Yes.

Q You testified earlier that you had two grants from US EPA.

Was the first grant used to prepare this 1976 report on Aroclor 1016?

A I do not recall specifically.

Q The 1976 study on Aroclor 1016 labeled Toxicity of PCB Aroclor 1016 to Mink, the bottom of the cover sheet of the report, the number US 9260, it has "Submitted By" and two authors, and then it says July 1, 1976.

Is that the date on which this report was submitted to US EPA?

A That would be correct.

Q If I read this correctly, the test itself was done during the time period January 1, 1976 to June 30,

1976?

A Yes, and therefore this was probably not -- yes, that is correct.

Q I take it you and Dr. Aulerich were commissioned by US EPA to do this study on Aroclor 1016?

A The grant was to me.

Q All right.

You were commissioned by US EPA to do this study which is now Exhibit F to your affidavit?

A Yes.

Q At the time you received the grant moneys and the commission to do this study, you were aware, were you not, that this would be used in the proceeding in Washington at which you later testified?

A I do not recall whether that was the case or not.

Q Doctor, you testified in Washington on October 14, 1976. How long prior to that date had you been retained by US EPA to testify in that proceeding?

A Would you repeat that date?

Q You testified on October 14, 1976 in Washington. I take it you had been retained by US EPA to testify sometime in advance of that. You didn't walk in cold off the street.

A You are probably correct. I am sure I did not walk in.

Q Do you remember that you were retained to testify by the EPA prior to the time you completed your report which is now Exhibit F to your affidavit?

A That could be the case, but I don't know.

Q Have you ever formally published this "Final Report" to the US Environmental Protection Agency on Aroclor 1016?

A Yes, it was presented earlier as Exhibit 2-B.

Q 2-B?

A Yes.

(Ringer-Monsanto Deposition Exhibit No. 5 marked for identification, 7/22/81, TLU.)

BY MR. FEATHERSTONE:

Q Doctor, I have had marked as Exhibit 5 your 1977 published report that I referred to earlier called Current Status of PCB Toxicity to Mink, and Effect on Their Reproduction, which was published in the archives of the Environmental Contamination and Toxicology.

Do you remember that report?

A Yes, I do.

Q Doctor, you would agree with me, would you not,

that this Exhibit 5 was published after you did the work for EPA on Aroclor 1016 which is Exhibit 5 to your affidavit of 1976?

A I cannot say that this was not submitted before that date since it takes approximately a year for a publication to come out.

Q My question, though, Doctor: The publication of what is now Exhibit 5 to your deposition came after you finished and submitted to US EPA your study of Aroclor 1016, which is now Exhibit 5 to your affidavit of 1976.

A Not the completed study, no, that would not be correct.

Q When you say not the completed study, what study are you talking about?

A Exhibit 2-B that was presented earlier extends beyond this date of Exhibit F.

Q Exhibit F to your affidavit?

A F to the affidavit.

Q My question, Doctor, is the report that you submitted to the United States EPA on July 1, 1976 showed results that you had in hand before Exhibit 5 was published, is that correct?

A I cannot be certain of that.

Q Do you have any reason to believe that the publication date of 1977 for Exhibit 5 is wrong?

A No, that is the correct date, but as I stated earlier, it takes approximately a year for a publication to come out; therefore, this was submitted in 1976.

Q And my question was simply this, Doctor: You would agree with me that the publication of Exhibit 5 came after you had completed and submitted a final report to the US EPA on Aroclor 1016 on July 1, 1976?

A I will agree that it will be as stated in Exhibit F.

Q Which itself says Final Report, doesn't it?

A For those dates.

Q The dates of January 1, 1976 to June 30, 1976?

A That is correct.

Q Doctor, in the course of all your publications, have you ever added a footnote to an article after you had submitted it for publication?

A Footnotes are added.

Q After an article has been accepted for publication?

A Such as?

Q Doctor, no, please answer my question first.

What I am interested in is I am asking

a general question about your experience in publishing articles in your peer publications.

A Additional data is never added, in my experience.

Q Have you ever added a footnote to any of your articles after they had been submitted for publication?

A If I can qualify that answer, I would be glad to answer it.

Q Why don't you answer the question first. After you have submitted an article for publication, have you ever, in all of the publications that you have produced, added a footnote?

A Yes, I have.

Q Have you in all of those articles that you have published, have you ever after you submitted any of them for publication, ever made changes in paragraphs?

A When they are submitted for peer review, yes, you must adhere to what the peer review has requested.

Q Have you --

A Or suggested.

Q Have you ever on your own, after you have submitted an article and it has been accepted for publication, proposed that certain paragraphs be modified?

A Not if it changes the meaning of the text, but to change word structure or sentence structure, yes.

Q After you have submitted articles and they have been accepted for publication and obviously before they have been published, have you ever added paragraphs or added sentences?

A These have been in light of the referees that have suggested changes.

Q Have you yourself ever suggested that other paragraphs or sentences be added to something that you had submitted for publication?

A I don't know. I would still have to qualify the question whether I added footnotes: Occasionally I have added an acknowledgment on the back or citation as to the sponsor of the grant or something like that as a footnote.

Q Let me ask you this, Doctor:

If after you submitted an article for publication you thought that in light of research that you had done since the article had been submitted cast some doubt on the results or conclusions you reached and expressed in the article that was submitted, would it be your practice to add a footnote or a paragraph or a sentence or something so indicating what your new research has shown?

A My procedure is to publish another article on

the subject matter.

Q And in your first article, you would just let it go as is even though it might be misleading or misconstrued?

A When I would report the data, I would report the data as it was obtained.

Q Doctor, let me ask you this:

If after you submitted an article for publication and it had been accepted for publication you changed your mind about the importance or significance of the conclusions shown in that article, would you make any changes to the article if you could before it came out?

A My policy, as I stated, is to report the data as it was obtained.

Q But answer my question. Is the answer no?

MR. WHITE: He just answered your question to the best of his ability.

THE WITNESS: Would you repeat the question?

MR. FEATHERSTONE: Would you read the question.

(Question read.)

BY THE WITNESS:

A I would still adhere to the contention that you report the data as it was obtained and your

interpretation of data at that time.

BY MR. FEATHERSTONE:

Q So the answer is you would not make the change?

A If that is as you interpret it, yes.

Q I am not interested in my interpretation. I am interested in your interpretation or your answer.

Is your answer that you would make the change?

A Basically, I do not change the results of an experiment.

Q That doesn't answer my question, Doctor. I will try it again.

I am not asking you to change the results of an experiment.

A I am not sure whether you are asking whether I changed the interpretation of the results --

MR. WHITE: Let him ask the question.

BY MR. FEATHERSTONE:

Q Doctor, I am not asking you to change the results of your experiments. What I am asking is this:

If after you had submitted your report like Exhibit 5 which contains both a description of the study, a numerical summarization of the results of your study, and at the end a description of your conclusions

and interpretations based on those results, if after you submitted an article like Exhibit 5, further research or new research caused you to change your opinion as to the conclusions or interpretations to be drawn from this study that you had earlier submitted, and assume further that you had an opportunity to make the change in the article before it was published, would you make the change to show your new conclusions or interpretations?

A To the best of my knowledge, I have not done that.

Q Would you do that?

A That is speculative.

MR. WHITE: Bruce, I think you would have to give the doctor an example of what you mean by a change, how miniscule, how difficult, how much it changes the conclusion.

He has answered the question, as I believe I understand it, as the data is reported in his statement.

MR. FEATHERSTONE: I am asking about his interpretations and conclusions.

BY MR. FEATHERSTONE:

Q Doctor, what difficulty are you having with my question? I have tried to make it as best as I can.

Obviously I cannot do it.

A Well, it is a question of degree that you are asking.

Q In other words, youmight make the change if it were a significant change in your conclusions or interpretations as opposed to one that was not so significant?

A I don't think that helps the question.

Q You said it was a question of degree. Degree of what? I will start from the bottom up: Degree of what?

A As I said, if it is a question of whether I would change the interpretation based on the data that was shown, no, I would not.

MR. FEATHERSTONE: Would you read the answer?

(Answer read.)

BY MR. FEATHERSTONE:

Q When you say data that was shown, that is the data that was reported in your study that was submitted for publication or the new data which causes you to reinterpret the old data?

A The data that is reported in the study being reported.

Q The one you had submitted for publication?

A Yes.

MR. FEATHERSTONE: Thea, go back and read the answer he gave before these two questions.

(Record read.)

BY MR. FEATHERSTONE:

Q Let me ask a question this way:

Are there any circumstances under which you would modify or change by footnote or by revision the conclusions or interpretations in an article that had been submitted for publication before it was in fact published where new research caused you to change your conclusions or change from the conclusions that were shown in the article that was submitted for publication?

A I have not done that, to the best of my knowledge.

Q Can you see any circumstances in which you would do that?

A You are asking me to project into the future. That is very difficult.

Q Is the answer no?

A Basically, yes, I would say no.

Q Doctor, when did you start working with mink?

A I moved to Michigan State in 1957 and mink

were part of our department's research at that time and I gradually became interested in mink, in the intervening years, early thereafter, soon thereafter.

Q So your personal research on mink began sometime shortly after 1957?

A That is correct.

Q And from whenever time that was until present, have you been working with mink?

A Yes, I have.

Q Why don't you put before you your affidavit of 1976.

In 1971, you published a study in the Canadian Journal of Zoology entitled Effects of Feeding Coho Salmon and Other Great Lakes Fish on Mink Reproduction.

A Yes.

Q This 1971 report summarizes the results you obtained as a result of feeding fish to mink in the years 1963, 1969 and 1970, is that correct?

A Yes.

Q Before the date of the report of the study that is reported in this 1971 article, have you conducted any fish feeding studies with mink?

A I have a report here with a 1970 date.

(Ringer-Monsanto Deposition Exhibit No. 6 marked for identification, 7/22/81, TLU.)

BY MR. FEATHERSTONE:

Q It is a double-page article entitled "Evaluation of Processed Great Lakes Fishery Products for Feeding Mink."

Does this Exhibit 6 which was published in 1970 summarize the results which were reported at greater length than your 1971 article?

A It is a different study.

Q A different study?

A Yes.

Q When was the study that is now reported as Exhibit 6 done?

A 1967 through 1969.

Q Was there any relationship between the feeding study that is reported in Exhibit 6 and the feeding study that is reported in your 1971 article? And by that I mean were they out of the same group of studies, were they designed for the same purpose?

A No.

Q What was the purpose of the feeding study that is reported in Exhibit 6, the 1970 article?

A The effort in Exhibit 6 was to produce a presscake of different Great Lakes fish in which some of the water and fat were extracted and then feed that fishcake to mink.

Q Why was it determined to extract the water and fat in manufacturing the presscake?

A This was an interest of the U.S. Bureau of Commercial Fisheries in Ann Arbor, Michigan.

They were interested in producing a presscake as part of the U.S. Bureau of Commercial Fisheries Department of the Interior and it is so stated in that little book.

Q Was the idea behind the project that is reported in Exhibit 6 to determine whether the presscake was nutritional for mink?

A That was a portion of it, yes.

Q What were the other portions of the project?

A The other purpose was that in pressing and producing the presscake, that some of the oil and water was removed and therefore some of the pesticides would also be removed.

Q Since you took a staff position at Michigan State University in the beginning of 1975, from the period of time 1975 until 1967, did Michigan State

maintain a stable of mink, if you will?

A A colony is the term that we use. Yes, we did maintain a colony of mink.

Q I take it the colony of mink, that was maintained by people in your department or at least under the direction of people in your department?

A Yes.

Q Had your group experienced any reproductive failures in mink in the colony of mink that Michigan State University maintained in the period 1957 and 1967?

A I cannot recall at this time.

Q Was fish or fish meal or fish-based products some portion of the diet at Michigan State University fed to its colonies of mink in 1957 to 1967?

A Again, I would have to say I don't know. I do not recall, I should say.

Q Your articles that were published in the early 1970s state that commercial mink ranchers fed mink a portion of their diet of fish.

A That is correct.

Q I take it that Michigan State University during the period of time 1957 to 1967 maintained at least a part of its colony of mink in accordance with commercial mink farming standards.

A Yes, we do.

Q Does that refresh your recollection that the commercial mink ranchers were feeding their mink a portion of diet of fish and that you were likewise at Michigan State University?

A We may or may not have used Great Lakes fish. We may have used ocean fish which we frequently do use.

Q You do frequently today, you say?

A Yes, we do.

MR. FEATHERSTONE: Since we have a thousand and one things to read during the lunch hour, I would suggest we break now.

MR. WHITE: Fine.

(At 12:15 o'clock p.m., a luncheon recess was taken to 1:15 o'clock p.m., this same day.)

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ILLINOIS
EASTERN DIVISION

THE UNITED STATES OF AMERICA, .	)	
	)	
Plaintiff,	)	
	)	
vs.	)	No. 78 C 1004
	)	
	)	
	)	
OUTBOARD MARINE CORPORATION AND MONSANTO COMPANY,	)	
	)	
	)	
Defendants.	)	

July 22, 1981

1:25 o'clock p.m.

The deposition of ROBERT K. RINGER resumed pursuant to noon recess at the U.S. Attorney's Office, 219 South Dearborn Street, 14th Floor Conference Room, Chicago, Illinois 60604, before Thea L. Urban.

PRESENT:

MR. JAMES P. WHITE,

MS. M. KAYE JACOBS,

MR. SEBASTIAN T. PATTI,

MS. ROSEANN OLIVER,

MR. JEFFREY C. FORT,

MR. BRUCE A. FEATHERSTONE.

R O B E R T K. R I N G E R,

called as a witness herein, having been previously duly sworn, was examined and testified further as follows:

DIRECT EXAMINATION (Resumed)

BY MR. FEATHERSTONE:

Q During lunch, Dr. Ringer, you took an opportunity to review the list of publications attached to Exhibit 1 and at my request you marked those articles that related or relate to PCB and the work that you have done.

Are those articles marked in red or with a red line?

A Yes, they are.

Q Did you so indicate those articles that relate to PCB, to the best of your ability?

A Yes, I did.

Q Doctor, it was in the late 1960s, was it not, that the concern about feeding of Great Lakes fish to mink first really surfaced?

A Actually surfaced a little before that. It was more the mid-1960s.

Q Mid-1960s?

A Yes.

Q From the mid-1960s when this concern began and until you published some results in 1972 or thereabouts, it was thought by mink ranchers and researchers like yourself the cause of reproductive problems in mink was attributable to pesticides in the fish feed of the mink, is that correct?

A That is correct.

Q Doctor, do you stay abreast of the literature that is published in your area?

A As best my ability.

Q Had anyone to your knowledge publicly stated the view that PCBs in fish fed to mink were responsible for the reproductive difficulties or the growth difficulties noted in mink in the 1960s? Had anyone said that publicly in the 1960s?

A Not to my knowledge.

Q Until your study came out in 1972, had anyone to your knowledge even suggested publicly that PCBs in fish fed to mink might be the cause of the reproductive or growth problems?

A I believe this was mentioned at a meeting that we were studying this, I believe in 1971, and that we thought that PCBs were involved.

Q Let us break that down for a second.

You said at a meeting in 1971.

A I did not say it. It was said by a --

Q I am sorry, my question was not clear.

The meeting was held in 1971?

A I believe so, that is correct.

Q What was the meeting?

A I cannot give you the exact title of the meeting. I believe it was either a workshop or it was a meeting held in conjunction with EPA at a site in Georgia. It is referred to someplace.

Q Let us forge ahead.

Were you at the meeting?

A No, I was not.

Q Was anybody connected with your studies at Michigan State at that time, in the late '60s, early 1970s, at that meeting?

A Yes.

Q Who was there?

A Dr. Hoopingarner.

Q You better spell that.

A H-o-o-p-i-n-g-a-r-n-e-r.

Q Was Dr. Hoopingarner the fellow who made this statement at that meeting in Georgia?

A Yes.

Q Is it your testimony then that before this point in time in 1971, no one to your knowledge had even publicly suggested that PCBs in Great Lakes fish fed to mink were the cause of reproductive or growth problems noticed in mink?

A That is correct, in my ability.

Q This report that you published in 1972 and the report I am referring to is called or entitled "The Effect of Dietary Polychlorinated Biphenyls on Growth and Reproduction of Mink," do you remember that study?

A Yes, I do.

Q This study was published in 1972, is that correct?

A That is correct.

Q Even this 1972 report of yours did not state conclusively that it was the PCBs in the Great Lakes fish fed to the mink that caused the reproductive and growth problems in mink, isn't that right?

A That is correct.

Q To your knowledge, were you and Dr. Aulerich the only people studying the effects of PCBs on mink in the early 1970s before your report was issued in 1972?

A I subsequently found that someone else was.

Q And this someone else was Dr. Platenow?

A That is correct.

Q His report was issued in 1973, is that correct?

A That is correct.

Q When you say you subsequently learned about Platenow, I take it that is when he published his study in 1973?

A Yes.

Q You didn't know anything about that before 1973?

A No.

Q Doctor, I have taken a look at Exhibit 6 which is your 1970 article, brief article, if you will, that summarizes certain results of feeding fishcakes to mink.

Doctor, nowhere in this report do you conclude that pesticides in fish fed to mink are not responsible for the reproductive and growth problems noticed in the mink, is that correct?

A Your question was nowhere do I not?

Q I am sorry. If that is the way it came out, I will rephrase it.

A Yes.

Q Your 1970 report, Doctor, dealt with the feeding of fishcakes to mink, is that correct?

A Yes.

Q I take it the purpose of the report was in part to determine whether the fish reproduced and grew normally as a result of being fed these fishcakes.

A Mink.

Q I take it the purpose of your 1970 report or study was to determine whether mink fed fishcakes grew normally and reproduced normally.

A That is correct.

Q And if I read this report correctly, your conclusion was that fish fed, if I read this 1970 report correctly, it was your conclusion that mink fed the fishcakes did not reproduce or grow normally.

MR. WHITE: Could he see the report?

MR. FEATHERSTONE: I will withdraw the question.

BY MR. FEATHERSTONE:

Q The fishcakes fed the mink were based on Great Lakes fish, is that correct?

A Yes.

(Ms. Jacobs entered the deposition room.)

BY MR. FEATHERSTONE:

Q I take it the purpose of using fishcakes was to get a leaner portion of the fish, if you will, that

would hopefully reduce the pesticide content of fish fed the mink, is that right?

A Yes.

Q The study that underlies the 1970 report, you did not conclude from that report, did you, that PCBs affected the reproduction or growth?

A No, there was no mention of PCBs in the article.

Q And this, I believe this 1970 study, report that is now Exhibit 6, you do not rule out the pesticide content of fish fed the mink as the cause of the reproductive or growth problems in the mink?

A That is correct.

Q Doctor, in several of your studies, you have used the phrase "totally acceptable reproductive parameters."

What does that mean?

A We have in the industry, the mink industry, that is, has a targeted acceptable number of young that they expect to be born from a breeding female. And when we attain that point or near that point, we consider it an acceptable reproductive level.

Q What is that point, Doctor?

A Of approximately four offspring to be born per breeding female. This may differ for different color

phase of mink and be just slightly below that, but for the dark mink, we generally use, we target it for four or more.

Q Dr. Ringer, so I am clear in my own mind, when you testified that it was commonly thought that pesticides in Great Lakes fish fed to the mink were the cause of problems in the mink, are you referring to DDT?

A DDT and its metabolites and dieldrin.

Q Was it also thought by the people in your area that mercury contamination of the Great Lakes fish fed to mink in the late 1960s was the cause of reproductive and growth problems?

A I don't believe mink ranchers thought that. We at the University suspected that it might be.

Q When you say it might be, you are referring to the mercury contamination might be?

A Could possibly be.

Q The cause of the problem?

A Yes.

Q I take it that you and the people at Michigan State University did not rule out mercury contamination of the Great Lakes fish as a possible cause of the mink problems until your 1971 study?

A No, we did not.

Q Am I right?

A We did not rule it out until that time.

Q Doctor, in one of your studies, you have this sentence and it reads:

"Rations which contained up to 15 percent of ground whole raw coho salmon were fed to mink before and/or during the reproductive period."

Does that mean that of the diet of the mink, 15 percent was fish and that fish portion was coho salmon?

A That is correct.

Q That statement that I just read you, was that based on a survey that you or Dr. Aulerich made?

A No, that was a report from the industry, either by telephone or through another individual to us.

Q I take it the 15 percent of the mink diet is fish finding in your article that you reported, you thought was very accurate?

A Yes.

Q Doctor, in your reports, you state that as a result of mink ranchers' concern about Great Lakes fish and their effect on the reproduction and growth of mink, the mink ranchers switched from Great Lakes fish to substitute food sources, is that correct?

A Yes, that is correct.

Q What types of substitute food sources were used?

A Ocean fish in many cases, ocean whiting or cod, herring.

Q Do the ocean fish that you just listed as the substitutes that were used by Great Lakes Basin mink ranchers, if you will, provide the same nutrition or vitamins that the Great Lakes fish contributed to the diet?

A Basically, yes.

Q You said that most of the mink ranchers switched from Great Lakes fish to ocean fish, if I may use that phrase?

A I think they may have used other protein sources, too, such as chicken or trimmings from the meat packing industry.

Q Let us take the chicken or the trimmings from the meat packing industry.

Would those substitute food sources provide the same nutrition or vitamins as the Great Lakes fish had provided?

A Never exactly could you substitute one meat for another and say it was exactly the same, you understand

that.

Q I understand that, but from a practical --

A From a basic practical standpoint, yes.

Q Doctor, did you or Dr. Aulerich or anyone in your group make any study of the commercial mink farming industry after the change or the switch from Great Lakes fish as a food source to ocean fish or the other substitute products?

A Not as a survey, but if they are having problems, the University is generally soon called into the picture.

Q Were there any problems that were brought to your attention or the attention of your group as a result of the switch from Great Lakes fish to ocean fish or these other substitute products?

A No, not to my knowledge.

Q It is my understanding, Doctor, that mink farmers measure the success of their operation by the reproductive ability of their farm, the fur quality of the mink, the growth and health of the mink.

A Basically, yes.

Q Has anyone at any time suggested to you that this switch from Great Lakes fish to ocean fish or these other substitute products in any way resulted in the

fur quality of the mink going down or being poor?

A No, not to my knowledge.

Q Did anyone at any time ever suggest to you that the switch from Great Lakes fish to these other substitute food sources adversely affected the reproduction of mink?

A No.

Q Has anyone at any time ever suggested to you that the growth or health of the mink has somehow been adversely affected by the switch from the Great Lakes fish to the other substitute fish products?

A No.

Q Doctor, have you or Dr. Aulerich or anybody you know of done any study about the comparative profitability of mink ranching in the 1970s versus the profitability of mink ranching in the early 1960s or late 1950s in the Great Lakes area?

A I have not.

Q When you testified just a moment ago that if there were any problems caused by the change from Great Lakes fish as a feed source to those alternative feed sources, they would come to the attention of the University, I take it that is because you and your department are very active in mink research?

A Yes.

Q I take it if for some reason some of these problems surfaced and somehow didn't get communicated to you, you would have found out about them through your other contacts, is that right?

A We would suspect that the information would get back somehow.

Q It is fair to say you have done a lot of work with mink, is that right, just generally?

A Sure.

Q Would you say that mink are very, very sensitive to a lot of different things?

A I would have to qualify that and say they are sensitive to certain substances and not to others.

Q When you say substances, are you limiting yourself to chemical substances?

A I meant chemical substances in this particular case.

Q Going away from chemicals for a moment, are mink susceptible, biologically susceptible to other types of things, like peculiarly susceptible to stress or loud noise or something of that nature?

A They are susceptible at certain times of the year to such disturbances.

Q I didn't mean to limit you to just that, but I am having a hard time articulating what it is I am looking for.

What I am looking for, are mink susceptible to happenings or things that they eat or noise or air that make them peculiarly susceptible to things of that nature, whereas other animals are not?

MR. WHITE: Answer the question if you can, Doctor. I would like to have it rephrased.

BY THE WITNESS:

A It requires somewhat of a qualified answer. Other animals are also susceptible to some of the same disturbances.

BY MR. FEATHERSTONE:

Q Let us take mink reproduction for a second.

Would you yourself characterize the mink reproductive system as very, very sensitive?

A Again, sensitive to certain things and not sensitive to others. Therefore, you cannot answer just yes or no.

Q Dr. Ringer, do you have any idea whether the total number of mink ranches in the Great Lakes area has increased or decreased since the early 1960s?

A My understanding is it is decreased.

Q Why is that?

A Trends of agricultural industries to get bigger.

Q In other words, consolidation of smaller mink ranches into bigger mink ranches?

A Not necessarily consolidating smaller into big, but small ones would have gone out of business and the successful ones would have grown larger.

This is true in many of the agricultural industries.

Q Other than the trend for bigger mink ranches, if you will, any other reason why the number of mink ranches has declined?

A In very recent years?

Q Let us take very recent years.

A The numbers, the total number of mink being produced in the United States has either been stable or increasing slightly.

Q In recent years?

A (Nodding.)

Q Doctor, you have to answer.

A Yes, in recent years, I am sorry.

Q How about since 1962? Has mink reproduction increased since that period?

A I couldn't state on that specific point.

Q I didn't mean when I said 1962, let us make it the early 1960s.

Has mink reproduction increased since that period of time?

A I still would not have that at my recall right now.

Q Would you have that information anyplace?

A Yes.

Q Where?

A That is available.

Q Where is that?

A It would be back in our office.

Q If I wanted to learn the answer to that question, where would I look besides your office?

A The Department of Agriculture in each state generally puts out a publication that lists year by year the statistics for animal reproduction within the state. I think you can find it in certain states listed.

Q Do you have any summary statistics for the Great Lakes region?

A No, I do not.

Q Doctor, have you done any work with wild mink?

A No, I have not, other than the few that we

have had. We have only had a couple that we've looked at in the past years.

Q Have you --

A No PCB work done on wild mink.

Q That anticipated several questions.

MR. WHITE: We thought it might.

BY MR. FEATHERSTONE:

Q Have you made any studies or observations about whether the numbers of wild mink in the Great Lakes area are increasing or decreasing in the last 20 years?

A I too have asked that question. I do not know the answer to it.

Q Whenever it was you asked the question, nobody could answer it for you, is that right?

A That's right, could not come up with an answer.

Q Let us take the health of the wild mink. Has that improved or gotten worse in the last 20 years?

A I don't know where you would find that information.

Q You don't have any opinion on that?

A No.

Q I anticipate this answer. Is it fair to say you don't have any knowledge or opinion as to whether wild mink are reproducing adequately or not?

A No, I do not.

Q Doctor, in your studies of the effect of PCBs on mink, you found that if the mink were taken off a diet that included PCBs, the effects on reproduction were reversible, is that correct?

A Yes, that was done on three animals.

Q Are you by that comment stating that that is an insufficient basis on which to render that opinion?

A Based on these three animals, I would say that your question was answered properly. Maybe I better, can I strike that and have the question asked again?

Q Let me move ahead to see what happens, Doctor.

Have you changed your opinion in any way that if you fed a mink a diet that contains some PCBs and then withdrew the PCBs from the diet, that the effect noticed were not reversible?

A No, I have not changed my opinion.

Q Have you done any further studies since the study of these three that you referred to earlier on the reversibility of the effect of PCBs on the mink?

A No, I have not.

Q Do you have any plans to?

A No, I do not.

Q So today it remains your opinion that the

effect of PCBs on mink are reversible if the diet is changed?

A Yes.

Q And you have stated that publicly, is that correct?

A It is published in writing.

Q Doctor, do you have in front of you your 1971 study entitled Effects of Feeding Coho Salmon and Other Great Lakes Fish on Mink Reproduction?

A Yes.

Q If I call that your 1971 study, you don't have any problem with that, do you? That was published in 1971?

A That is correct.

Q With what has been provided to me, you did not publish any other Michigan feeding study in 1971, did you?

A No, I did not.

Q So we are on the same wave length by calling it the 1971 study?

A I did publish other articles though.

Q I don't doubt that.

Doctor, in the 1971 mink feeding study, your report states that you and your group fed the mink

yellow perch, coho salmon and bloater chub, is that correct?

A Yes.

Q Were you involved in the selection of these three species of fish to feed the mink?

A I was involved in the establishment of the study, yes.

Q Were these three species selected because commercial mink ranchers used yellow perch, coho salmon and bloater chub as fish feed to mink?

A I do not remember whether that was the basis for the selection.

Q Do you have any recollection of the basis for the selection of the perch, salmon and the chub in the feeding study you ran between 1967 and 1969?

A Typical of research that is done, a group of researchers combined their knowledge and arrive at a decision based upon availability, based upon some specific attributes that one might be looking for in the species selected and maybe several other reasons.

Q What were the specific reasons underlying the selection of the perch, the salmon and the chub in the 1967, '68 and '69 feeding studies?

MR. WHITE: If you recall that, Doctor.

BY THE WITNESS:

A I am not sure I recall back that many years.

BY MR. FEATHERSTONE:

Q Doctor, in reviewing your 1971 report, I nowhere found any PCB measurements of the fish fed to the mink.

A I believe that is correct.

Q Were the fish that were used in the feeding studies in 1967, '68 and '69 analytically scanned for PCBs?

A Subsequent to this, yes.

Q When you say this, you are indicating your 1971 report?

A This publication, yes. But I don't think all the species were tested, I am not sure.

Q Sometime after the 1971 report was published, you and your group scanned the fish used in the feeding studies in 1967, '68 and '69 for PCBs, is that right?

A We had some additional fish in the freezers which were analyzed for PCBs.

Q Was this work done by Dr. Zabik?

A Yes, it was.

Q In the subsequent reports, Doctor, you have made some statements about the range of level of PCB in

the coho salmon used in the studies in the late 1960s.

A Yes, I did.

Q Nowhere else in those subsequent reports did I find any statement about the level of PCBs used in the yellow perch or the coho salmon that were used in the study.

A That is correct.

Q Is that because only the coho salmon were subsequently analyzed for PCBs?

A Yes, that is true.

Q Nowhere in your reports after 1971 do I find any breakdown of PCB levels into the various chlorinated PCBs, is that correct?

A Would you restate that? I forgot the date.

Q In reports issued after the 1971 study which you have in your hands, Doctor, there is only a description of the range of total PCBs in coho salmon that were used in the feeding studies that were used in the 1960s.

A That is correct.

Q Nowhere did you break down that total PCB level into the various chlorinated PCBs.

A That is correct.

Q Was Dr. Zabik asked to break down the total

PCB level into the various chlorinated PCBs?

A I don't believe so.

Q Did Dr. Zabik do the analytical work for the amount of pesticides in the perch, chub and salmon that were used in the late 1960s feeding studies that is reported in Table 9, Doctor?

A I believe it states the analysis was done by the National Marine Fisheries Service in Ann Arbor, Michigan, and that would be Dr. Bob Reinert.

Q Was he given any instructions about what to report as a result of his analysis, and by that I mean was he told only to report DDT, dieldrin or other metabolites?

A As I recall, yes.

Q Did he at any time report back PCB levels?

A Not on this study.

Q Did he report any interferences in DDT or dieldrin or metabolites that he found on the basis of analysis of fish?

A Again, not that I recall.

Q Doctor, the 1972 study that you did is entitled Effects of Dietary Polychlorinated Biphenyls on Growth and Reproduction of Mink.

A Yes.

Q In that study you report the results of a feeding study that involved coho salmon?

A Yes.

Q I take it this was a mink feeding study of coho salmon after the late 1960s studies that are reported in your 1971 report?

A I have to check the dates because this was --

Q When you say this, that is the 1972 study?

A 1972, I am sorry, is partially a review and partially presenting new data.

Q Well, the new data that is reported in your 1972 study, that includes in part the results of the coho salmon or the use of coho salmon in mink feed?

A Yes, it does.

Q The new work that underlies the 1972 report, you did not use chubs or perch as mink feed, is that correct?

A No.

Q And I am right, am I not, that at no time after the late 1960s did you use bloater chubs or yellow perch as mink feed in your studies?

A Not that I recall.

Q Why was it that the new study that is reported in your 1972 report was based only on the feeding of

coho salmon to the mink?

A Basically the reason for this was brought about because the industry in Wisconsin had fed the coho salmon and reported back adverse reproductive performance.

Therefore, we were interested in the coho salmon.

Q You said the industry in Wisconsin, is that what you said?

A Yes.

Q These are the mink ranchers in Wisconsin?

A Yes.

Q Could mink ranchers use yellow perch or chubs as fish feed instead of coho salmon?

A Yes, they could.

Q And were there mink ranchers in Michigan or Illinois that were using yellow perch or bloater chub instead of coho salmon?

A I believe in past years, they have.

Q Did anyone report back to you that yellow perch or bloater chubs as a fish source in the mink feed were causing any problems in the mink?

A The report was generally a statement that the feeding of Great Lakes fish was causing problems. That

was called to, first called to my attention through Dr. Hartsough in Wisconsin.

Q This was in his 1965 report?

A I believe it was 1965.

Q Did anybody, either Dr. Hartsough or anybody in your profession or any mink rancher tell you they had experienced difficulties in feeding yellow perch or bloater chub to mink?

A I do not know, per se, but those species were selected.

Q The only particular species you learned about causing adverse effects was coho salmon?

A Correct.

Q Thank you.

Returning to your 1971 report for a minute, Doctor, in that report you set forth the results of a feeding test run using coho salmon canning by-products.

What are those?

A The by-products were that portion of the coho salmon that was left after they had been filleted in a Michigan plant and this represented the heads, the viscera and any meat that was trimmed off the fillets.

Q If I understand you then, the fillet of coho

salmon is that that is sold for consumption by humans?

A Yes, that was my understanding.

Q And the by-products of this process is the stuff that is not consumed by humans?

A Yes.

Q It was the conclusion of your report, was it not, that whatever it was that was causing problems in the mink was concentrated in the by-products?

A Apparently so, based on the results.

Q Did you run any tests on the mink using salmon fillets as the feed source?

A No.

Q Why not?

A I have no reason why not, but we did not.

Q The 1971 report, Doctor, does not rule out the possibility that the pesticides of DDT and dieldrin might be causing the problems in mink?

A We could still not rule it out at that time.

Q Doctor, what information did you pick up after doing the feeding tests in the late 1960s that led you to test the PCBs on mink?

A I attended a meeting in which several of us discussed the problem and the subject of the presence of PCBs was brought up.

Q What was this meeting? Was this a meeting of people in your profession?

A I believe it was held in Wisconsin in conjunction with -- there is a national, or you might term it international meeting of mink ranchers that is held, and at that time was in Milwaukee.

Q Who was it that suggested to you that maybe it was the PCBs in the fish that was causing the problem?

A The suggestion was not made that the PCBs in fish was causing the problem. It was a discussion that Dr. Hickey from the University of Wisconsin and I happened to have about birds eating along the Great Lakes and I believe he was looking at the content of PCBs in these birds or in their eggs. I don't recall the exact details, and so it was somewhat of a chance discussion.

Q Doctor, do you have your 1972 report in front of you?

A Yes, I do.

Q The third paragraph of the report?

A Yes.

Q The first sentence after the semicolon, the last part of the sentence begins "however."

A Yes.

Q It reads:

"However, hydrocarbon pesticide contamination (total DDT and isomers or dieldrin) of the fish fed was inversely proportional to a number of mink offspring born per female."

That conclusion, is that based on your 1971 study?

A Yes, it is, shown in Figure 1.

Q Shown in Figure 1 of --

A Graphically shown in Figure 1 on Page 615 of the Canadian Journal of Zoology, the 1971 report.

Q Meaning in essence that as the level of pesticide residue increased, the total number of offspring decreased?

A Yes.

Q Doctor, one of the tests that you ran and reported in this 1972 paper involved the direct application of 30 parts per million concentration of PCBs to the diet?

A Yes, I did.

Q As a preliminary matter, did the total diet fed the mink have a concentration of 30 parts per million PCBs?

A Yes, that is what we targeted it as.

Q And if you flip to Table 5 on Page 153 of your 1972 report --

A Yes.

Q -- where I see 1 part per million were PCB, 5 parts per million PCB and 15 parts per million PCBs in separate feeding tests, does that mean that the total concentration of PCBs in the diet of the first group of 1 percent per million --

A That's correct.

Q And the total concentration of the diet was 5 parts per million PCBs?

A Yes.

Q Would you please turn to Page 150 of your 1972 report.

A I have it.

Q The 30 parts per million concentration was made up of 10 parts per million Aroclor 1242, 10 parts per million Aroclor 1248 and 10 parts per million Aroclor 1254, is that correct?

A Yes.

Q How did you decide to use 30 parts per million PCBs and how did you decide to break it down into 10 of those three?

A The rationale was based upon, as you so indicated before, that we had had some of the coho salmon analyzed for this PCB content, and taking at that time into consideration reports that were appearing in the literature, that the level was somewheres in the neighborhood of 18 to 20 parts per million within the coho salmon.

Therefore, if we fed the diet at 30 percent of the diet, then the total diet, assuming no additional PCB added from the other ingredient contributed to the diet, would be roughly 6 parts per million, 30 percent of a 20 parts per million variable.

And I took a fivefold safety factor above that because we were looking whether this would have an effect and came up with a value of 30 parts per million.

Q In essence, your 30 parts per million PCB contamination in the diet was five times greater than you believed the mink were naturally being fed through the diet?

A If they had been consuming the fish with this concentration that I indicated at 30 percent of the diet, yes, you are right.

And the selection of Aroclors was based on the fact that at that time we did not identify which specific Aroclor was contributing to the peaks that were seen in the analyses and so ten of each was --

Q If I understood you correctly, because Dr. Zabik didn't break out the total PCBs by the particular chlorinated PCBs, you just took the range of 1242, 1248, 1254 and divided it into three and used equal parts of each?

A That is correct.

Q If you go back to Table 5 on Page 153 of the 1972 report, you ran feeding tests involving 1, 5 and 15 parts per million PCBs. PCBs used in those tests were entirely Aroclor 1254, is that right?

A Yes.

Q How did you make the decision to use 1254 rather than 1242 or 1248?

A I cannot say for certain at this time.

Q At the time that you ran these tests that are reported here on Aroclor 1254 in the diet, did you make any tests with just Aroclor 1242 or 1248 in the mink diet?

A Would you repeat the question again?

Q Certainly.

Your 1972 report --

A Yes.

Q -- shows the results of feeding tests run using 1, 5 and 15 parts per million concentration of PCBs.

A Yes.

Q And those PCBs in those tests was 1254?

A Yes.

Q Did you run any other tests involving 1242 or 1248 Aroclors in this time period, the early 1970s?

A Not in feeding trials, no.

Q You said "not in feeding trials." Did you run them in any other type of trials back in the early 1970s?

A On mink, there certainly would have been no chronic toxicity studies to look at the reproduction with those compounds at that time.

Q This Aroclor 1254 study that you ran as reported in the 1972 paper, that is what you would consider a chronic toxicity effect on reproduction?

A Yes, yes.

Q You did not find a no effect level for Aroclor 1254 on the tests that you ran on that report in this 1972 paper, did you, Doctor?

A As you will note, the 1 part per million PCB Aroclor 1254 gave kits per female a life of 4.3.

Now, this was slightly below our control value of 6, but we still accepted it as meeting our standard as acceptable level of reproduction.

Q Would you conclude therefore that the feeding trial that you were performing using 1 part per million Aroclor 1254 showed it was a no effect level?

A I don't think you can unequivocally say that is no effect.

Q Does the phrase no effect level have any technical meaning to you, Doctor?

A Yes, it does.

Q What does it mean?

A This means it does not produce any adverse effects that you can determine.

Q Does it mean, Doctor, does a no effect level mean there is no statistically significant adverse effect that you can determine from your tests? There is always a possibility of a chance of adverse effect that is different from your control group?

A Yes, there is a chance of adverse effect.

Q I would take it that your no effect level would rule out chance occurrences of a difference.

A That is what you hope to do by statistics.

Q So a no effect level would then be a level of which there is no statistically significant differences between your test group and the control group?

A On the parameter that you are measuring.

Q Through the results that you attained from this feeding test involving 1 part per million of Aroclor 1254, was that statistically significant from the results shown by the control group?

A I do not recall what statistics were applied to that particular set of data.

Q Doctor, in your mind have you found a no effect level for Aroclor 1254 in feed for mink?

A Based on our research, we are accepting levels up to 1 part per million as no effect levels. That is only reproduction. I would like to qualify that.

Q Is the no effect level lower for other criteria?

A Well, if one was to look at possibly induction of enzymes at a chemical level, you could find an effect below this point.

Q Doctor, with the exception of the PCB tests on mink that are being run by that foreign exchange student back in his home country and the test that is now ongoing at Michigan State, is there any PCB testing

ongoing that you were involved in or that were conducted at Michigan State University that were not reported and putting aside the documents you have produced here today?

A Not to my knowledge. I think we have reported most, almost all of our research or all of it.

Q Doctor, was it your conclusion based on this 1972 study that PCBs consumed by mink through their consumption of fish may well have different effects on the mink than PCBs consumed by mink that were directly added to their diet?

Is the question confusing, I can restate it.

A No, I understand the question.

At the stage that this paper was published, we merely came to the conclusion that it could have been the presence of PCBs in the coho salmon and possibly in other Great Lakes fish that was contributing to the problem, but we did not specifically separate whether there was a difference between added Aroclors and that which was coming through the fish.

Q In your 1972 report, you summarized results you have observed on mink from a diet to which you added directly 30 parts per million concentration of PCBs, is that correct?

A Correct.

Q In that 1972 report, you also summarized the results you observed as a result of feeding like mink in another group coho salmon, such that the PCB consumed by that group were about 6 parts per million total diet concentration, is that correct?

A I believe that is a different study, but reported in the 1972 publication, if I understood you correctly. You were comparing 30 parts per million -- I am sorry, can I strike my answer?

Q Well, you cannot strike it, but you can answer over.

A Can I start over?

We did compare 30 percent coho salmon against a basal diet to which we had added 30 parts per million.

Q That is 30 percent coho salmon diet that you estimated had resulted in roughly 6 parts per million total PCB concentration in that diet?

A Approximately.

Q In essence then, you were comparing a diet with a total concentration of 6 parts per million against another diet that had a total concentration of 30 parts per million PCB?

A Yes.

Q Is it true that what you observed with the results were very, very similar for the two groups?

A The results of PCB tissue residues were very similar of those animals that died as stated in Table 2.

Q How about the reproductive results?

A The reproductive results in that both of them failed, both groups failed to reproduce.

Q So the reproductive results were very similar, too?

A Yes, but I think you will note that all 12 of the mink receiving the basal diet plus 30 parts per million PCB died, whereas, that is, the adults died, whereas that is not true of those receiving the 30 percent coho salmon.

Q They died after the breeding period, didn't they?

A Or during the breeding period.

Q Doctor, is it fair to say that from the conclusions you reached in your 1972 paper that you could not say that if mink were fed coho salmon containing 2 parts per million of Aroclor 1254, that there would be any adverse effect on reproduction?

A We did not have that information at that time.

Q And you cannot reach that conclusion today, can you, Doctor?

A If one were to accept Dr. Platenow's values where he fed to the cow at approximately 6/10ths of a part per million, based on analyses, then it could be suspect, but --

Q Let us put him aside. I am going to get to him.

On the basis of studies that you and Dr. Aulerich and your group have run at Michigan State University, you cannot conclude, can you, Doctor, that coho salmon containing PCB levels of 10 or fewer parts per million were fed 30 percent of a mink diet that the mink would suffer any adverse effects?

A If they contained 10 parts per million in the coho and they were fed at 60 percent of the diet?

Q No, let me start over again.

A They would.

Q It is a fact, isn't it, that you could not conclude from your studies that if a coho salmon containing up to 10 parts per million of Aroclor 1254 were fed as 30 percent of the diet of mink that that mink would suffer any reproductive or growth effects, adverse growth effects?

A This would end up as a total dietary intake of roughly 3 parts per million in the diet. If based on our results showing that 2 parts per million of Aroclor 1254 caused adverse effects, that is published subsequent to the 1972 publication, then I would have to say there is a possibility that we would get some detrimental reproduction.

Q Doctor, are you able to conclude from your studies that 3 parts per million applied directly to the mink diet will have the same consequence in mink as 3 parts per million in the mink diet which come through coho salmon?

A We have not made an attempt to determine that answer.

Q So you cannot say that from your studies?

A Not unequivocally, no.

Q Indeed, isn't that the reason that you hedged in the last paragraph of your 1972 report?

MS. JACOBS: I object to the form of the question.

MR. FEATHERSTONE: Mr. White is here.

BY MR. FEATHERSTONE:

Q Which reads, "The results of these experiments clearly point out the sensitivity of mink to polychlorinated biphenyls and casts suspicion on PCBs as a possible factor

involved in the poor reproduction following Lake Michigan coho salmon feeding."

A I am familiar with the statement. That was the state of our knowledge at that time when this was published.

Q I agree with that, Doctor, but my question is isn't it a fact that the last paragraph of your 1972 report is a result of the fact that you could not conclude that the direct dietary intake of a certain level of PCBs would have the same effects as a dietary intake of PCBs coming in through the coho salmon?

A It was based upon the fact that if we had 30 percent coho salmon or approximately 6 parts per million and we fed 5 parts per million of Aroclor 1254, we had equivalent adverse results on reproduction.

Q Why don't you just explain that, Doctor. How did that influence your writing the last paragraph of your 1972 report?

A It is significant that since we had adverse effects with almost total failure for the females to give birth to live young offspring as we did with the feeding of 30 percent coho salmon.

Q Where are you comparing this, Doctor?

A I am looking at Table 5 with 5 parts per million

PCB added as Aroclor 1254; the last column shows 0.8 young born per breeding female that was alive, contrasting that into that same study with raw coho salmon was introduced, was fed in the diet as 30 percent of the diet and we had zero young born. These results are similar.

Q But not similar enough to make you conclude that PCBs in the coho salmon was the cause of the problem?

A As an absolute --

Q Scientific certainty?

A -- scientific decision, no.

Q Doctor, you have stated publicly in recent years that it was the PCB in the coho salmon fed to the mink in the late 1960s that caused the problem, is that correct?

A Yes.

Q These recent statements that you made are not based on any feeding studies involving the fish contaminated with PCBs, is that correct?

A It is based upon feeding studies.

Q Your recent studies are based on more recent studies involving PCBs than are reported in your 1971 and 1972 study?

A Partially, yes.

Q When after 1972 did you do another mink feeding study involving Great Lakes fish?

A For example, if you will turn to the 1977 study entitled Current Status of PCB Toxicity to Mink and Their Effect upon Reproduction, in Table 3 on Page 238 of the Archives of Environmental Contamination and Toxicology, you will see we took a basal diet consisting of 30 percent ocean fish and we took another diet consisting of Lake Michigan coho salmon in which we acetone hexane extracted the ocean fish in the basal diet and also the coho salmon and by the combination of experiments there, you will see that it was in the substance that was causing the problem that was contained in the acetone hexane extract.

Q Is that a new study that is reported in a 1977 article?

A I believe it is.

Q When was that study performed? All I see is January 25 to roughly June 30.

A I cannot say exactly at this time, but it must have been conducted before 1974 or into 1974, possibly.

Q Doctor, you referred earlier to a study by Dr. Platenow -- is that how you pronounce his name?

A Yes.

Q I take it you are familiar with that study.

A Yes, I am. That is published.

Q Have you ever spoken to him about his work?

A Not to my knowledge.

Q Has there been anyone other than yourself and Dr. Aulerich and the people working under you and this report of Dr. Platenow who have done work on mink?

A Other than our graduate students?

Q Yes.

A That are working with us, no, not to my knowledge, not on PCBs.

Q Did you draw any conclusions from Dr. Platenow's work as reported in his 1973 article, "Dietary Effects of Polychlorinated Biphenyls on Mink"?

A Did I draw any conclusions was the question?

Q Yes.

A Yes, I did.

Q What were the conclusions?

A I was interested in similarities of clinical symptoms and histological, his histological examinations.

Q Dr. Platenow used Aroclor 1254, did he not?

A Yes, he did.

Q And he found effects on mink from Aroclor 1254

levels as low as 4.6 parts per million, is that right?

A That is the way he reported it, yes.

Q Did you question his conclusions in any way?

A No, I did not.

Q Did Dr. Platenow's conclusions affect your opinion as to the no effect level for Aroclor 1254 in the diets of mink?

A The values that he reported are below what I have so indicated to you as there are no effect.

Q Did you in light of Dr. Platenow's report and conclusions, is it your conclusion that the no effect level for Aroclor 1254 in mink is under 1 part per million?

MS. JACOBS: No effect level with respect to what types of results?

BY THE WITNESS:

A With respect to what, reproduction, if you will qualify it that way.

BY MR. FEATHERSTONE:

Q All right, qualify it that way.

A I am still going to base my opinion on our results.

Q So Dr. Platenow's work doesn't cause you to change your conclusions in any way?

A No.

Q Doctor, I want to go to the 1977 paper which you wrote and published.

A Yes.

Q If you will look at Page 286 of this paper, Table 10.

A 287.

Q I am sorry, 287, Table 10, is it the conclusion of your study that the no effect levels per reproduction of mink for Aroclor 1016, 1242 and 1248 is 2 parts per million?

A You omitted 1254.

Q That's right.

A Based on these results, I would have to say it is 2 parts per million or about, since we did not determine the no effect level.

Q How did you decide to use just 2 parts per million in the testing of 1016, 1221 and 1242?

A That is based on approximation using the data presented in the 1972 paper, that it was somewhere between 5 and 1 that caused adverse effects.

Q It was somewhere between 5 and 1 part per million for Aroclor 1254?

A That is correct.

Q So you used that range to determine the feeding levels for Aroclor 1016, 1221 and 1242?

A Yes.

Q Why didn't you run a range of concentration testing for Aroclor 1242, for instance?

A The best judgment I could say at this time is based upon the availability of animals for testing and space that we have. We cannot do, could not do all levels desired. It certainly would have been desirable.

Q You also ran an acute toxicity test or a LD50 test on Aroclors in May, is that correct?

A That is correct.

Q It was your finding that this LD50 test, the lower chlorinated PCBs were more toxic than the higher chlorinated PCBs?

A As stated, yes.

Q Is it also fair to state that it has been your conclusion based on the chronic test that the higher chlorinated PCBs are more toxic than the lower chlorinated PCBs?

A That is correct.

Q Have you been able to reconcile the difference?

A As you will note, a portion of this was based

upon the LD50 and within a four-day period of time.

Q So?

A I would, if I were to repeat that, use a longer period of time in the future. Our primary interest is not in determining LD50. Our interest has continued to be what is the chronic effect on reproduction where we have used long term feeding.

Q Is the reason why you are not all that concerned about the LD50 testing of mink because the possibility of an exposure that would result in acute poisoning of mink is virtually nil?

A Under the circumstances of our interest, yes, your assumption is correct.

Q I noticed in your studies that you test to see the mortality of the kits within the end of a four-week period after birth.

A Yes.

Q Why is that?

A This is a period when the offspring are nursing the female and therefore it gives us an indication of that which may be passed through from the lactating mother to the offspring.

Q Are the kits during that four-week period receiving any food other than direct from the mother?

A No, they do not partake of solid food.

Q In this study, when you tested 2 parts per million concentrations of various Aroclors, was that again 2 parts per million concentration of the total diet?

A Of the total diet, yes.

Q Doctor, would you please turn to Page 288 of your 1977 study.

A Yes.

Q The paragraph beginning:

"The suspicion that PCB contamination of Great Lakes fish..."

Do you see that paragraph?

A Yes.

Q Would you read that to yourself, please.

A I have read it.

Q Is that your conclusion based on all the studies that you had run to date and that were published as of this publication in 1977?

A That is correct.

Q Doctor, would you please turn to Page 289.

A Yes.

Q The top of the page, the last sentence beginning:

"From these results and those reported by Platenow and Karstad (1973) it would appear that mink are more sensitive to PCBs in rats," with a citation and "mice" with a citation and "birds" with a citation.

I take it that was your conclusion based on those studies that you had run at the time of this publication in 1977?

A Yes, it remains as my conclusion.

Q Remains?

A Remains as my conclusion, yes.

Q Doctor, would you agree with this statement:

"Different animal species vary greatly in their susceptibility to toxic effects of PCBs"?

A Yes.

Q Do you agree with this statement:

"Different animal species vary greatly in their susceptibility to a particular dietary level of PCBs"?

A Yes.

Q Do you agree that at a particular dietary level of PCB, some animals may show adverse effects, some animals may not show any adverse effects?

A If we are talking about the same adverse effects or the same parameters, yes.

Q I don't understand your answer. What do you mean by same parameters?

A Again, I will use an example. If in one species you are looking at enzyme induction and in another you are looking at reproduction, one animal may show the effect at maybe an equal level, at the same level. In other words, you could get enzyme induction, and this is a hypothetical example, you could get enzyme induction in the bird at the same level that you could get adverse effect upon reproduction parameters in the mink, but you are not using the same end point as a measure.

Q Doctor, do you agree that at a particular dietary level of PCB, you may have some effects on one animal and no effects that you can detect on another animal?

A Yes, I would agree.

Q Doctor, based on your review of the literature in your experiments, would you agree with that statement:

"Certain species of mammals appear to be especially sensitive to ingestion of low levels of PCB"?

A Yes.

Q I take it you would agree that based on your work and work that you have seen that the mink is one species of mammal that is especially sensitive to PCB?

A Yes, I would.

Q Doctor, would it be fair to say that insofar as reproduction is concerned that the mink is the most sensitive mammal to PCBs?

A It is either equal to or the most sensitive.

Q What would it be equal to?

A Work at the University of Wisconsin has shown the monkey. also to be extremely sensitive and we were talking about approximately the same levels.

Q Would you agree with this statement:

"An extreme example of the special sensitivity of certain species of mammals to PCB was shown by the effects on mink"?

A Would you restate that for me, please?

Q Would reading it be sufficient?

A Yes.

MR. FEATHERSTONE: Would you read the question.

(Question read.)

BY THE WITNESS:

A Yes, I would agree with that.

BY MR. FEATHERSTONE:

Q Doctor, I take it you would agree with this statement as well:

"The significance of a given concentration of PCBs in the food of an animal such as a mink may be quite different than it is to a human"?

A I'm sorry. Could you read it?

(Question read.)

BY THE WITNESS:

A I basically have to agree with that.

BY MR. FEATHERSTONE:

Q Doctor, it is true, is it not, that from your studies you cannot say with a reasonable degree of medical or scientific certainty that humans eating Lake Michigan fish with PCBs will suffer any adverse health effects?

A Your question was without any?

MR. FEATHERSTONE: May I have the question read to the witness?

(Question read.)

BY THE WITNESS:

A A qualified no.

MR. FEATHERSTONE: What was the answer?

(Answer read.)

BY MR. FEATHERSTONE:

Q What is your qualification, Doctor?

A There were several words that were used that I questioned. I believe you said without any reasonable certainty with a reasonable degree, medical or scientific.

MR. FEATHERSTONE: No, no, listen to the words.

THE WITNESS: That is what I was trying to do. It was a little too fast for me.

MR. FEATHERSTONE: We can have it read back, Doctor. You can have her read it back as many times as you need.

(Question reread.)

BY THE WITNESS:

A With a reasonable degree -- that is a matter of conjecture, what is meant by a reasonable degree. Can I get it more specific?

MR. FEATHERSTONE: You have for all time destroyed the legal profession.

BY THE WITNESS:

A If you ask me unequivocally without any doubt whatsoever in my mind --

BY MR. FEATHERSTONE:

Q Let me ask it this way, Doctor:

Can you say, Doctor, based on your studies with mink that people, humans eating Lake Michigan fish

with PCB residue will suffer any adverse health effects?

MS. JACOBS: Are you going to state a level of PCB residue in those fish, Bruce?

MR. FEATHERSTONE: The doctor can answer the question.

MR. WHITE: Let him answer the question.

BY THE WITNESS:

A If you are speaking about 2 parts per million concentration in the fish or lower, I would answer you yes. But if you were to ask me 200 parts per million or more, I would possibly, promptly answer you no.

BY MR. FEATHERSTONE:

Q When you say yes in response to the question if the assumed level is 2 parts per million in the fish, is it your testimony that you cannot conclude from your studies that a human eating Lake Michigan fish with a PCB residue level of 2 parts per million will suffer any adverse effects?

A There is always a little difficulty in extrapolating directly from one animal to another animal which you are asking me to do here. There is always some conjecture in doing that.

Therefore, I set a fairly low level as a safe level.

Q Based on your studies, 2 parts per million PCB residue level in the fish consumed by humans, Lake Michigan fish, would be safe?

A That would be my statement, yes.

Q I take it when you say 2 parts per million PCB residue level, you are talking about in the edible portion of the fish?

A Yes, that the human would consume.

Q After preparation and cooking?

A Yes, yes. But I am saying at a high level, at the extremely high level --

Q Like 200 parts per million?

A Yes.

Q Doctor, I take it when you testified that consumption of edible fish with 2 parts per million PCB residue was in your judgment safe, based on your tests, you are talking about chronic consumption of fish?

A Yes, average consumption for the human.

Q Is it also your conclusion, Doctor, that chronic consumption by humans of Lake Michigan fish with 5 parts per million PCB concentration is safe, and I am talking about 5 parts per million in the edible portion of the fish?

A Based on my experience, I would have to say that would depend on the stage in life, I am saying of this human being, and possibly the sex of this human also.

Q Doctor, you testified earlier that you were having some difficulty answering these questions because, as you put it, I am asking you to extrapolate from studies on mink to effects on humans, is that right?

A It is always a little difficult, as I stated, yes.

Q In your judgment, is it particularly difficult to draw conclusions for humans based from your research from mink because of their special sensitivity to PCBs?

A I think one should look at all animals' results in making those judgments about humans, as many as possible.

Q Would you answer my question?

A Sensitivity to the other extreme of insensitive animals. So therefore, I would use the results on the mink and the monkey along with the rat, the mouse, the cow in making a judgment.

Q In other words, the universe of toxicological data?

A As much as is available.

Q Doctor, have you ever been asked to draw conclusions on the effect to humans from PCB exposure based on your studies of mink or other animals?

A In class, yes. In teaching, yes.

Q Not in teaching but by other medical experts?

A The only other place I have ever been asked this has been in testimony, but not to the medical profession, no.

Q Nobody from the Michigan Department of Public Health, for instance, ever contacted you and asked you for your expertise?

A I do not recall any such inquiries.

Q Doctor, you conducted these tests on the effects of PCBs on mink and the feeding tests of Great Lakes fish to mink in order to determine the effect on mink?

A That was the purpose.

Q The purpose was not to determine the effect on humans?

A That is correct.

Q Doctor, let me ask you this question:

You do not, do you, conclude from your studies that humans eating Lake Michigan fish will necessarily experience the same effects as the mink?

A With a qualification that you put in there of necessarily, I would say yes.

Q Doctor, have you made any projections about the trends of PCB levels in Lake Michigan fish?

A I have not personally, no.

Q Have you at all followed the reports of the PCB levels in Lake Michigan fish?

A From an inquiry scientifically done in this area and an interest into this area, it has been called to my attention; at times that has happened.

Q Are you aware that the reported PCB levels in fish have declined in Lake Michigan?

A Yes, I am aware.

Q Are you aware that in the last five years, species like the bloater chubs reported PCB levels declined by half?

A I would not agree it is specifically one-half. I know it is declining.

Q You also know that the levels are declining rather significantly?

A Yes.

Q Have you made any projection, Doctor, about when Great Lakes fish in your judgment may be suitable for use as fish feed for mink?

A This again would be based, I have not made any projections because that would have to be based upon the locations from where the fish were taken and analyses of the fish.

Q Is there any particular PCB level in the fish at which you would say on the basis of your studies that the fish are safe for use as a feed for mink, and I am talking about Lake Michigan?

A Yes.

Q And at what PCB levels?

A I am saying at a total level of approximately 1 part per million in the diet, we are considering the level as being safe. This, of course, is a time dosage response and therefore I would certainly see no harm in the mink ranchers possibly feeding that low a level during the growing phase.

I would consider maybe not feeding it during the reproductive phase.

Q Have you or anybody in your group made any projection about when the 1 part per million level might be reached in the fish?

A My statement, I hope, was 1 part per million in the total diet.

Q Okay.

I take it that would support roughly 3 parts per million in the total fish?

A If we fed at 30 percent of the diet, yes.

Q In your conclusion as to the safe level of PCB in the diet of mink, do you make any distinction among the various chlorinated PCBs?

A Yes, I would.

Q If we were talking about Aroclor 1242 in the diet of mink, what would be your safe level?

A I believe I would keep it at the level I have just stated.

Q If it were 1248, what would be the level?

A Same level.

Q 1254?

A Same level.

Q Is this 1 part per million safe level for 1242, 1248 and 1254 based on the assumption that ground whole raw fish will be used as the fish portion of the diet?

A Yes.

Q If I understand your earlier testimony, Doctor, there is available commercially a fish meal of some sort, is that correct?

A I believe raw fish would also be available.

Q Has your group done any PCB analytical scans on the fish meal for PCB content?

A Yes.

Q What have been those results?

A I couldn't give you that information. We have it, but I could not give it to you now.

Q Is 1 part per million safe level that you just testified to, are these conclusions of yours based in any way on this ongoing study that is being done at Michigan State presently?

A No.

Q Is this ongoing study at Michigan State -- I may have asked this before and I apologize if I have -- in any way involved the feeding to mink of whole ground raw fish as opposed to fish meal?

A I believe I answered that probably our control was whole ground raw fish, but I don't know that any Lake Michigan fish are included in that as whole ground fish.

Q Is the fish meal prepared by cutting away the fish by-products, if you will?

A I could not state this because I think I indicated earlier that this was produced commercially.

Q Has Dr. Aulerich made any effort to find out

how it was prepared?

A I couldn't answer for him.

Q Has anybody in your group made that determination?

A I couldn't answer that.

Q Doctor, do you know whether any of the fish that are used in this commercially available fish meal come from the Waukegan, Illinois area?

A I have no knowledge of that.

Q I take it you likewise have no idea whether any of the PCBs in any of the fish that are ground up for fish meal got into the fish in Waukegan Harbor were from the Johnson Motors discharge?

A I have no knowledge.

Q Doctor, I want you to assume that for the foreseeable future, the next 10 to 50 years, the atmospheric fallout of PCB will be such that the levels of PCB in the Great Lake Michigan fish, whole fish, will be 3 parts per million or better.

I take it under those circumstances you would not recommend that that fish be used as feed for mink?

A That would be my recommendation, certainly not at the 30 percent level of the diet.

MR. FEATHERSTONE: Would you read that back.

(Record read.)

BY MR. FEATHERSTONE:

Q I have to put my question to you again.

I want you to assume, Doctor, that the atmospheric fallout of PCB into Lake Michigan, that that alone will for the foreseeable future, the next 10 to 50 years, result in PCB levels in whole fish of 3 parts per million or greater.

I take it under those circumstances, you would not, for that period of time anyway, recommend that Lake Michigan fish be used as feed for mink at a 30 percent level?

A You are correct.

Q Doctor, do you have any idea whether assuming Waukegan Harbor was dredged so that it was virtually PCB-free, whether that would result in Lake Michigan fish being safe for mink ranchers?

A I am not an expert on sediments, their movements and hydraulics.

Q The question is, Doctor, did you have any idea? Is the answer no?

MR. WHITE: Would you read the question back again.

(Question read.)

BY THE WITNESS:

A My answer would be no. I would not speculate on that.

MR. FEATHERSTONE: Let us take a break for a minute.

MR. WHITE: Let us make it 10 minutes.

MR. FEATHERSTONE: That's fine.

(Brief recess had.)

MR. FEATHERSTONE: My comment is I want to have the opportunity tonight to take a look at the documents Dr. Ringer has produced today and his testimony from the other two proceedings and finish up what questions I have, if any, tomorrow.

I simply don't know what those documents say, and Rose and I have discussed this and we have decided, and she can correct me if I am wrong, that Roseann is going to ask some questions that she has at this stage.

We are both going to go back and look at the additional documents and if we have any remaining questions, we will ask them tomorrow.

MR. WHITE: So basically what you are saying is the Exhibit 2-A, 2-B, 3-A, B and C, and those documents that would relate to the testimony in hearings, you would limit yourself to the examination tomorrow on

those documents and any questions that reasonably follow therefrom?

MR. FEATHERSTONE: Reasonably loosely used. I will represent to you, Jim, that the documents I had and you know which ones they are referred to these studies. I have asked, I think, all the questions I want to ask. I may go home tonight and run five miles and have a brainstorm of an idea and I don't want to foreclose myself from that.

But if your question is are we going to come back here tomorrow and do basically the same thing we had done today, the answer is no.

MR. WHITE: I take that representation and I suppose that goes for OMC also?

MS. OLIVER: I never get any brainstorms. What I ask now --

MR. WHITE: Nor do you run five miles.

MS. OLIVER: I am not taking any chance of getting any brainstorms or of running five miles.

I don't have too much here.

DIRECT EXAMINATION

BY MS. OLIVER:

Q Dr. Ringer, you brought with you today articles you wrote in and testimony.

Do you have any other materials with you today relating to the PCB work you have done?

A That we have done, no. This is all I have. I don't think anyone has asked for that.

Q This is a 1973 study entitled Reproductive Failure and Mortality in Mink Fed on Great Lakes Fish. That is an additional study besides the one that we have already gone into today?

A Yes. To my knowledge, it has not been addressed today.

MR. WHITE: Nobody spoke about this one today.

MS. OLIVER: Can I see it a minute?

THE WITNESS: Sure, I just want to check something.

BY MS. OLIVER:

Q Does that provide any additional experiments in addition to the ones reported in the 1971 study?

A In addition to the 1971, but I am not sure that it was not included in the 1972 and the '77 papers. That is what I was checking when I handed it to you.

Q If you can just check through it very quickly and tell us if what is reported in that 1973 paper is also reported in other studies we have already talked about today.

A This paper was now come of an invitational

presentation made in Scotland.

Q Okay.

A If you follow me, and therefore it reviews our state of the knowledge at that time.

Q Reviews the work you did up to 1973?

A Yes, but other than that I have no knowledge of any other publication that you do not have.

Q Am I correct that your work with respect to effects of PCBs on minks related to the growth and the survival and the reproduction in minks?

A Yes.

Q You mentioned earlier, discussed a little bit a term called enzyme induction.

A Yes.

Q Have you done work in that area?

A In collaboration with biochemists, yes, we are doing some work in that area.

Q Is that related to levels of PCBs?

A Yes, it is. I am not directly involved in that.

Q Someone at the Research Center at Michigan State is involved in it?

A Parts of my department, yes.

Q Are these studies done on mink?

A Yes. That paper is in publication, was just accepted and has come back from the referees for looking at right now.

Q Have your opinions concerning the growth, reproduction, survival of mink been based in any way on the enzyme induction work that has been done?

A No.

Q I take it from your answers to Mr. Featherstone's questions, based on your work and the background, you don't believe you are qualified to give opinions on the effect of PCBs in fish as affects human beings?

A Not as a direct extrapolation.

Q In what way?

A I believe --

Q Do you feel you are qualified to give opinions concerning PCB levels in fish in Lake Michigan as affects humans?

A As one doing scientific investigations on one animal, I also look at the results in other animals. Therefore, I feel I can extrapolate their findings also as they do.

What I am saying is I can extrapolate as someone else, as one who works on rats could extrapolate.

Q Are you telling me that you have an opinion as to the effect on human beings for PCBs in fish in Lake Michigan?

A As to the possible effect, I believe I stated in answer to the question that this would depend on the state in the life and the sex of the individual.

Q You gave Mr. Featherstone some levels that you believed would be safe for humans.

A Yes.

Q That is your opinion?

A Yes.

Q In being asked to testify in this case, have you been given any information about PCB level investigation in Waukegan Harbor or Lake Michigan on the Illinois side?

A Yes, I have.

Q What information have you been given?

A I have the report here, or two. You have a copy of the mathematical model by, I presume it is Dr. Thomann.

I have a report by Dr. Nesbitt; Illinois Department of Conservation, Division of Fisheries and Wildlife.

Q The creel survey?

A By Bruce Muench. One is a 1979 report and a 1980 report; the Outboard Marine Corporation Biological Studies Report, which was prepared by the U.S. Environmental Protection Agency.

Q February 1979?

A 1979; the December 1979 report on the Waukegan Harbor Biodegradation and Deperation Study; Dr. Veith's report of the Environmental Research Laboratory of Duluth on uptake and elimination of PCBs in fish contaminated by the Waukegan Harbor; a letter from a Dr. Lombardo --

MR. FEATHERSTONE: Bring this back with you tomorrow.

MR. WHITE: Let me just see what he is going to bring back with him tomorrow.

MR. FEATHERSTONE: The stuff you provided him with.

MR. WHITE: We may have provided him with them, but that doesn't mean it is discoverable.

MR. FEATHERSTONE: The testifying expert, Jim?

MR. WHITE: The testifying expert. Certainly letters that we write to our expert witnesses from attorneys or personnel, for example, in EPA, that is not discoverable.

MR. FEATHERSTONE: It is the basis of his opinion.

MR. WHITE: It is the basis of his opinion. I am not holding back anything that is the basis of his opinion.

It's all there.

MS. OLIVER: Let's see where we stopped here.

BY MS. OLIVER:

Q This is dated December 20, 1976 to Mr. Blake Biles, with an attachment letter to Mr. Harry L. Wight of Sidney, Williams; a two-page handwritten legal-size list of items with the name H. Zar in the first page entitled Information on Fish at Waukegan Harbor Available to US EPA as of 4/7/81.

MS. JACOBS: That probably has not been produced.

MR. FEATHERSTONE: I know it hasn't. I am an expert on your April '81 --

MS. JACOBS: No '81. You have all the rest.

MS. OLIVER: A letter from Brigadier General Robert Moore to George Alexander dated April 13, 1977, with an attachment called A Model System Study of the Release of PCB from Hydrosoils and Subsequent Accumulation by Fish, and a handwritten note entitled Lake Michigan Materials, with an attachment from the United States Department of the Interior, Fish and Wildlife Service, with a stamped date of April 4, 1979, and a one-page

listing of different Pydraul products with a page number 2 at the top.

BY MS. OLIVER:

Q These are the materials that were given to you, Dr. Ringer, that you were asked to look at?

A For my perusal, yes.

Q When were you given these materials?

A If I can give you an exact date, June 12, 1981.

Q Were you asked to read certain matters?

A I was asked to look through the material.

Q Do you have correspondence from someone at EPA or from the Government attorney asking for your testimony in this case?

A I have no -- in order to read this, is that what you are saying?

Q Order for you to prepare to testify in this matter, did you get any correspondence concerning what your testimony would be or in what way you could testify?

MR. WHITE: Do you understand the question, Doctor?

THE WITNESS: Yes, I do.

MR. WHITE: Answer it.

BY THE WITNESS:

A I have a letter from, a signature James P. White, as of June 17, 1981.

BY MS. OLIVER:

Q Does that letter discuss your testimony in this case?

A It doesn't.

MR. WHITE: I have no problems. Let me just take a look at it.

I have no problem with it.

BY MS. OLIVER:

Q Dr. Ringer, have you been asked to testify in certain areas in this lawsuit, certain subject matters?

A My area of expertise is the effect of PCBs on mink. That is my expertise.

Q Survival, growth and reproduction of mink?

A Correct.

MS. OLIVER: What I would like to do, Jim, is to break for the day now and I want to look through some of this material here.

MR. WHITE: Do you want me to Xerox all of this? You have it all.

MS. OLIVER: Some of it I don't have.

MR. WHITE: You don't have Howard Zar's memo?

THE WITNESS: I have no idea what it is.

MR. WHITE: That's fine. All I am saying --

MR. FEATHERSTONE: The mastermind of the litigation,

Zar and White.

MS. JACOBS: No, just Mr. Zar.

MR. WHITE: Let us go off the record for a minute.

(Discussion off the record.)

(At 4:10 o'clock p.m., the deposition was adjourned, to resume at 11:00 o'clock a.m., Thursday, July 23, 1981.)

Thea L. Urban
Certified Shorthand Reporter
134 South La Salle Street
Chicago, Illinois 60603
312 - 782-3332

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ILLINOIS
EASTERN DIVISION

THE UNITED STATES OF AMERICA,	)	
	)	
Plaintiff,	)	
	)	
vs.	)	No. 78 C 1004
	)	
OUTBOARD MARINE CORPORATION AND MONSANTO COMPANY,	)	
	)	
	)	
Defendants.	)	

I hereby certify that I have read the foregoing transcript of my deposition given at the time and place aforesaid, consisting of Pages 1 to 145, inclusive, and I do again subscribe and make oath that the same is a true, correct and complete transcript of my deposition so given as aforesaid, as it now appears.

_____
Robert K. Ringer

Subscribed and sworn to
before me this ____ day
of _____, A.D. 1981.

_____
Notary Public.

Thea L. Urban
Certified Shorthand Reporter
134 South La Salle Street
Chicago, Illinois 60603
312 - 782-3332

UNITED STATES OF AMERICA)
NORTHERN DISTRICT OF ILLINOIS)
EASTERN DIVISION) SS:
STATE OF ILLINOIS)
COUNTY OF COOK)

I, Thea L. Urban, a notary public in and for the County of Cook and State of Illinois, do hereby certify that ROBERT K. RINGER was by me first duly sworn to testify the whole truth and that the above deposition was recorded stenographically by me and was reduced to typewriting under my personal direction, and that the said deposition constitutes a true record of the testimony given by said witness.

I further certify that the reading and signing of said deposition was not waived by the witness and his counsel.

I further certify that I am not a relative or employee or attorney or counsel of any of the parties, or a relative or employee of such attorney or counsel, or financially interested directly or indirectly in this action.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my seal of office at Chicago, Illinois, this _____ day of _____, A.D. 1981.

_____
Notary Public, Cook County, Illinois.
My commission expires May 31, 1983.

Thea L Urban
Certified Shorthand Reporter
134 South La Salle Street
Chicago, Illinois 60603

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ILLINOIS
EASTERN DIVISION

THE UNITED STATES OF AMERICA,	)	
	)	
Plaintiff,	)	
	)	
-vs-	)	No. 78 C 1004
	)	
OUTBOARD MARINE CORPORATION and MONSANTO COMPANY,	)	
	)	
	)	
Defendants.	)	

The continued deposition of ROBERT RINGER, called by Monsanto Company, pursuant to notice, was resumed on Thursday, July 23, 1981, at 219 South Dearborn Street, Room 1486 Conference Room, at the hour of 11:00 o'clock A.M.

PRESENT:

MR. JAMES WHITE,
(Assistant United States Attorney
United States Attorney's Office
219 South Dearborn Street, 15th Floor
Chicago, Illinois 60604)

and

MS. M. KAYE JACOBS,
(Water Enforcement Division,
U.S. Environmental Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604)

appeared on behalf of the United States of America;

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PRESENT: (Continued)

MS. ROSEANN OLIVER,
(Phelan, Pope & John, Ltd.
30 North LaSalle Street
Chicago, Illinois 60602)

and

MR. BRUCE A FEATHERSTONE,
(Kirkland & Ellis,
200 East Randolph Drive
Chicago, Illinois 60611)

appeared on behalf of Monsanto Company.

* * * * *

ROBERT RINGER,

called as a witness by Monsanto Company for examination, having been previously duly sworn, was examined and testified further as follows:

DIRECT EXAMINATION

BY MS. OLIVER: (Resumed)

Q Dr. Ringer, you understand this is a continuation of your deposition yesterday, and you are still under oath.

A Yes, I do.

Q When we recessed yesterday, you had produced for us a stack of documents which you had been provided for this case. Have you reviewed all those documents?

A I have perused them.

Q Have you relied on any of the material in those documents in order to reach any of the opinions that you testified to yesterday concerning the effect of PCBs on the survival, reproduction and growth of mink?

A No, I have not.

Q Do you intend to review those documents for purposes of your opinions or your testimony?

A No, I do not.

Q Have you been asked to review the materials in those documents for purposes of your testimony in this case?

A I was given them just to look over, not to be a part of my testimony.

Q In the test that you testified about yesterday, your experiments on the feeding of PCBs into the diet of mink, you testified that the PCB substances that you have used are 1016, 1242, 1248 and 1254.

Could you tell me how you obtained those substances?

A Yes. They were obtained originally directly from Monsanto.

Q Were they obtained by you from Monsanto?

A In some cases, yes; and in another case, I believe they were obtained by Dr. Hook of Michigan State University.

Aroclor 1016 was supplied, in the one study, was supplied by EPA, US EPA.

Q So the Aroclors 1242, 1248 and 1254 were supplied directly from Monsanto?

A That is correct.

Q Who is Dr. Hook?

A He is a member of the Animal Science Department of Michigan State University.

Q In the first feeding studies that you did, correct me if I recall incorrectly, you used all three of those Aroclors, 1242, 1248 and 1254 in the diet of the mink, is that correct?

A That is correct.

Q Did you obtain for that study those Aroclors directly from Monsanto?

A To the best of my knowledge I did.

Q Do you recall with whom you contacted or spoke at Monsanto concerning receiving those Aroclors?

A I have had some contact with Mr. Papageorge.

Q Have you had any contact with anyone else at Monsanto?

A Not to my knowledge.

Q Have you had more than one contact with Mr. Papageorge?

A I know of one occasion where we had a personal contact.

Q When was that?

A I do not know the exact year. It was early in our studies. So I would say in either 1970 or 1971.

Q What was the purpose of your personal contact with Mr. Papageorge at that time?

A He was on the campus of Michigan State University, and I believe I was asked to go to lunch with him.

Q Do you recall the substance of your conversation with him?

A No, I do not.

Q Do you recall the topic?

A No, I do not.

Q How did you go about getting the Aroclor substances from Monsanto?

A I believe it was by letter.

Q To Mr. Papageorge from you?

A That would be the best of my knowledge.

Q Have you retained the correspondence with Monsanto?

A I don't know whether that would be on file.

Q Would that be in your office at Michigan State?

A If I did have it, yes, it would be.

Q Would you look for it, and if you find correspondence relating to obtaining Aroclors from Monsanto or any communication with Monsanto, would you provide it to Mr. White?

A Yes, I will.

Q Do you recall if you received the Aroclors in one shipment, or did you receive more than one shipment, that you used for your test through the years?

A Probably, to the best of my knowledge, only one shipment from Monsanto.

The shipment from EPA was a separate shipment.

Q The shipment from the EPA concerned only 1016?

A To the best of my knowedge, yes.

Q Do you recall how many of the Aroclors you received, what quantities you received from Monsanto?

A They were in, I believe they are approximately half pint containers, and we would have been supplied with something approximating two containers of each Aroclor, each Aroclor.

Q The feeding tests that you conducted with

these Aroclors covered what years?

A Approximately 1970 through 1974.

Q Am I correct that after 1974 your feeding studies involved only 1016?

A No. We have additionally done 1242.

Q Did you obtain additional amounts of 1242?

A I will have to check.

Q Were the containers, the half pint containers you received marked in any way, do you recall?

A I believe they are.

Q Are they marked with the Aroclor number on them?

A Yes, yes, definitely.

Q Do you have any left?

A I presume we do.

Q Where would it be kept at Michigan State?

A It would be stored in my laboratory, locked.

Q Will you go back and check and see what, if any, of those Aroclors you have left in your laboratory?

A Yes, I will.

Q And provide them to Mr. White.

A Yes.

Q The 1016 Aroclor that was used in your studies,

do you know how EPA obtained that?

MR. FEATHERSTONE: 1016.

BY MS. OLIVER:

Q 1016.

A No, I do not.

Q In the feeding study that you conducted, the PCBs that were fed to the mink were only a part of the diet, is that correct?

A (Indicating.)

Q You are referring me to -- Let's go back a minute.

With respect to my question concerning the quantities of the Aroclors you received from Monsanto, you are referring me to Exhibit 3-B, Footnote 4 on Page 2 that states, "Electrical grade, lot #KB-05-415, Monsanto Co., St. Louis, Mo."

A Yes.

Q That refers to what?

A Aroclor 1242.

Q What does "Electrical grade" mean?

A That is off the container as supplied to us.

Q "#KB-05-415," what does that refer to?

A That is also on the label.

Q The label also says, "Monsanto Co., St. Louis, Mo."?

A Yes, it does.

Q So the Footnote No. 4 indicates what was on the label that you received on the 1242 Aroclor?

A That is correct.

Q Do you know what the #KB-05-415 meant?

A That is a lot number. Beyond that, I do not know.

Q Do you have an understanding of what electrical grade meant with respect to that Aroclor?

A No, I do not.

Q I think my question was with respect to the feeding studies in which you fed PCBs into the diet of the mink. I am correct that the PCBs were only part of the diet, right?

A Yes, they were.

Q The rest of the diet included such things as meat and chicken, is that right?

A Yes, it does, and other meat and cereal grains.

Q Were any procedures or testing done to determine whether any of the other part of the

diet that the minks were getting contained any PCBs?

A The entire diet was analyzed, but not individual ingredients.

Q How was the entire diet analyzed?

A By gas chromatography.

Q For each one of the feeding studies that was done?

A Probably not.

Q What did the analysis of the diet, what was that intended to show?

A Whether we were on target, or whether the amount was in there that we targeted to be in there.

Q Did you keep records of the amount of PCBs found in the entire diet?

A This was done by Dr. Zabik.

Q Before the entire diet was analyzed, you made a determination of what quantity, what percentage of PCBs to add to the diet, is that right?

THE WITNESS: Would you read that back.

(Record read by the reporter.)

BY THE WITNESS:

A The amount that would be added was predetermined.

BY MS. OLIVER:

Q Then you added PCBs into the diet, and then you analyzed the entire diet?

A That is correct.

Q Did you have a range of PCBs that you wanted to reach in the diet, or did you have a specific parts per million that you wanted to reach?

A We targeted for a parts per million concentration.

Q When you say targeted, does that mean that you used that diet, fed that diet to the mink only if you reached the parts per million that you wanted?

A By this I mean you weigh out an appropriate amount to give you that amount in parts per million in the diet, in the whole diet.

Q So you analyzed the diet, and then you added the PCBs?

A No.

Q Okay. Tell me how you did it.

A You have the weight of diet, and you weigh out a known amount of PCBs to be added to that diet. That is what I mean by targeted. So that the end product of the complete diet would come out with

so many parts per million.

Q Well, I guess my question is -- Maybe I should just ask a question.

How did you determine that the end result that you were coming up with in your diet that you wanted was not attributable in any respect to the cereal or the meat products or the poultry products that were part of that diet?

A In all cases you use a basal diet, in addition, as part of your study.

Q Was the basal diet analyzed?

A Yes, it was.

Q Were any PCBs found in that, that you recall?

A I do not recall.

Q Dr. Zabik analyzed the basal diet as well?

A Yes.

Q By the "basal diet," we are talking about the diet without the PCBs added, or supplemented to the diet?

A Correct.

Q I think I asked you this a little bit ago, but were these analyses done by Dr. Zabik on the

feeding tests that you did in 1970-1971?

A To the best of my knowledge, yes.

Q Do you know what method of analysis Dr. Zabik used?

A No, I do not.

Q You are not an analytical chemist.

A That is correct, I am not an analytical chemist.

Q In your report, and specifically if you look at the report that has been marked Exhibit 2-A entitled "Polychlorinated Biphenyls (Aroclors 1016 and 1242): Effects on Survival and Reproduction in Mink and Ferrets."

A Yes.

Q At the bottom of Page 1 of the article you refer to the difference between 1242 and 1016 may be the result of reduced level of contaminants in the 1016 mixture. Do you see that? I am paraphrasing the last sentence in that paragraph.

A Yes, I do.

Q On the next page, the end of the first full paragraph there you again say the Aroclor 1016 mixture also contains lower level of contaminants,

such as chlorinated dibenzofurans and chlorinated dibenzodioxins than the more highly chlorinated PCB mixtures. Do you see that?

A Yes, I do.

Q Can you tell me what testing you did to determine what contaminants, if any, there were in the higher chlorinated PCB mixtures?

A We did not test for that, that is referenced in that sentence.

Q Do you know if there were any such contaminants in the 1242 or 1248 or 1254 Aroclors that you used in your feeding studies?

A We have no direct evidence.

Q Do you have any indirect evidence?

A No.

Q You mentioned the study done by the foreign exchange student.

A Yes.

Q That is being completed, or the paper is being written.

I don't think you were asked what type of study that was.

A I believe I did answer that this was to

study the effect upon thyroid hormones that are in circulation in mink and estradiol.

Q Does that study involve any specific PCB substances that you found, that were found?

A Specific Aroclor?

Q Yes.

A 1242.

Q So when that study is completed that will discuss the effects of Aroclor 1242?

A In mink, on these specific hormones in circulation.

Q In your report designated Exhibit 2-B entitled "Toxicity of the Polychlorinated Biphenyl Aroclor 1016 to Mink," if you will look for a minute at Page 1, the Introduction, the second paragraph there.

A Yes.

Q Would you read to yourself the last sentence.

MR. WHITE: The second paragraph?

BY MS. OLIVER:

Q Beginning, "Polychlorinated biphenyls tend to concentrate . . . "

A Yes. I have read it.

Q Is that your opinion stated in that sentence?

A Yes, it is.

Q Is that an opinion of yours based on the work you have done with mink?

A Yes.

Q Is the hazard that you referred to in that paragraph again referring to the reproduction, growth or survival of mink?

A Yes, through the feeding of fish.

Q Were you aware when you wrote this paper that there were -- I mean there are PCB decreasing -- Strike that -- levels of PCBs in fish decreasing in Lake Michigan?

A Yes, I was aware of that.

Q Were you aware of what the levels of fish in Lake Michigan were?

A In some of the fish, yes.

Q Are you aware today of what some of the levels of fish in Lake Michigan are?

A In the approximate range, in parts per million.

Q Are there certain fish that you believe are a hazard to mink because of the PCB levels present?

A Since these compounds tend to accumulate within the adipose tissue, the fat tissue of the body, those that seem to be fatter in composition seem to pose a greater problem.

Q What fish in Lake Michigan are included in that category?

A Such as the coho salmon, the alewives.

Q Any others that you would consider to present a problem to mink?

A I would have to recheck values.

Q You would agree that the extent of any problem to mink from PCB levels in coho salmon and alewives depends on the level of PCBs in those fish?

THE WITNESS: Could I have that read back.

(The record was read by the reporter.)

BY THE WITNESS:

A Yes, I would.

BY MS. OLIVER:

Q You would also agree that any problem to mink from PCB levels in coho salmon or alewives would also depend on the mixture, the type of PCB mixture in those fish.

THE WITNESS: Could I also have that one read back.

(The record read by the reporter.)

BY THE WITNESS:

A Yes.

BY MS. OLIVER:

Q Your opinion as stated on Page 1 of the exhibit refers to the fact that hazard will be present for many years to come. Do you have an opinion on how many years?

A No, I do not.

Q Do you have any limits in time on how you view this problem?

A No, I have not extrapolated a time factor.

Q This report, which is marked Exhibit 2-B, was prepared under your grant from the EPA, is that right?

A Yes, that is correct.

Q Mr. Gilman Veith was the Project Officer?

A Yes, he was.

Q Did Mr. Veith participate at all in the preparation of the report?

A I believe the Foreword was written by him.

Q Anything else that you recall?

A No.

MR. WHITE: Take your time, review it.

BY THE WITNESS:

A I believe possibly Page 24 was prepared by someone associated with Dr. Veith.

BY MS. OLIVER:

Q Anything else?

A No.

MR. FEATHERSTONE: You have to answer audibly.

BY THE WITNESS:

A The answer is no.

BY MS. OLIVER:

Q What was Dr. Veith's role as a Project Officer? What did he do as a Project Officer, or what is a Project Officer?

A He merely supplied the grant money and the Aroclor 1016.

Q Now, I take it that the opinions you have expressed in your testimony yesterday and today, and in your reports to date may be modified or changed by the feeding study that is presently being done

at Michigan State.

A No, I do not believe that it is directly applicable to change any data that is presented.

Q Not any data, but any opinions you may have as to the effect of PCBs on mink reproduction, growth or survival.

A I would not at this time speculate what the results would be, and therefore I could not render an opinion.

Q All right. But because you don't know what those results may be, there is a possibility that the opinions that you have reached on the basis of the other testing may be modified or altered or changed in some way by new data.

MR. WHITE: Roseann, I want to make one of my few objections. I think the doctor has adequately answered your question with respect to the effect of this study that is ongoing right now, based on his answer now. If you read back the last answer, I think that is his last answer.

MS. OLIVER: I am talking about opinions, not data. I want to make sure.

MR. WHITE: You are asking him to speculate beyond what he has already testified to. He cannot do that.

BY MS. OLIVER:

Q It is possible, isn't it, Dr. Ringer?

A The results will be reported as the data come out.

Q And your opinions will be based on the data that is available.

A That is correct.

Q You were asked yesterday if there was any ongoing work being done with respect to PCBs, and you mentioned a feeding study that is being completed. Do you have any plans to do any further studies?

A To the best of my knowledge we have no -- I have no plans to do feeding studies on PCBs on reproduction in mink.

Q Do you have plans to do any other studies on PCBs?

MR. WHITE: This is at present, his immediate plans as of today?

MS. OLIVER: If he has any plans as of today.

BY THE WITNESS:

A No immediate plans as of today.

MR. FEATHERSTONE: We are not looking for an estoppel. If he changes his mind two years from now --

MR. WHITE: Or receives a grant from somebody next month or in September, fine.

MS. OLIVER: Yes.

MR. WHITE: That is understood.

BY MS. OLIVER:

Q Have you applied for any grants to do any PCB studies?

A No, not to my knowledge.

Q Have you proposed to do any further PCB studies?

A Part of our group will be looking at PCBs as they would affect enzyme induction, but I am not involved in that.

Q What part of your group would be doing that?

A This will be done by colleagues and by graduate students.

Q Under whose supervision?

A Dr. Hook is going to be doing the enzyme

induction work.

Q Is your group --

A That is only planned. It has not started, and may never be done.

Q Is your group planning to do any support work for that study in any way?

A No.

Q To your knowledge that's the only proposed PCB work contemplated?

A That is, to the best of my knowledge.

Q Dr. Ringer, have you reached any opinions on the effect of PCBs in Waukegan Harbor on the growth and survival or reproduction of mink?

A No, I have not.

Q Have you reached any opinions on the effect of PCBs in Waukegan Harbor on the mink industry?

A No, I have not.

Q Am I correct that you have not kept yourself up to date on the status of the mink farming, mink ranch farming industry in the Great Lakes Region?

A Not directly, only from indirect comments that might be made.

Q There are no problems that you are aware

of right now in the mink ranch industry in the Great Lakes Region relating to reproduction of mink, are there?

A Yes, there are.

Q What are you aware of now?

A Only by telephone conversation direct from one mink rancher.

Q That's the person you referred to yesterday in your testimony?

A No.

Q What is the problem?

A He does not know, other than he has poor reproduction.

Q Where is this farmer located, or rancher?

A I believe it is, from the conversation on the telephone, roughly sixty miles north of Columbus, Ohio.

Q Is that in Michigan?

A Columbus, Ohio.

Q Have you done any tests on the relationship of PBBs to reproduction in mink?

A Yes, I have.

Q The feeding study that you did relating to

PBCs, did you analyze any of the diet for PBBs?

A Certainly not those prior to 1974.

Q Why is that?

A The exposure in the State of Michigan didn't take place until late 1973.

Q You have found that PBBs also adversely affect reproduction in mink, is that true?

A In that we frequently lose the female during the breeding season, we get very poor reproduction.

Q It would be hard to reproduce without the female.

A Yes.

Q So on the studies, feeding studies done from 1971 through 1974, there were no analyses of of the diets for PBBs?

A That is correct.

Q PBBs.

A That would be correct.

MS. OLIVER: I don't think I have anything else.

MR. FEATHERSTONE: I do have some questions, Doctor.

REDIRECT EXAMINATION

BY MR. FEATHERSTONE:

Q Let's start first with the PBBs. Your response to Miss Oliver's question was that there were certainly no scanning of the diet for PBBs prior to 1974, which as you described it the day of the exposure in Michigan to PBBs.

Did you in fact scan the diet after 1974 for the presence of PBBs, other than in those tests in which you added the PBBs directly?

A No, we did not.

Q Well, would you look at I believe it's Exhibit 4, which is your affidavit of 1976. Yes, Exhibit 4 is your affidavit of 1976.

If you look at the Attachment F, which is the report you submitted to EPA on July 1, 1976 with respect to Aroclor 1016, nowhere in that report do you state that you scanned for PBBs in the diet of the mink, is that correct?

A That would be correct.

Q That's because no such scan was run.

A That is correct.

Q Did you ever test any mink with PCBs

manufactured in Europe?

A No, I have not.

Q How about PCBs manufactured anywhere other than by Monsanto Company?

A No other compound other than Monsanto's.

Q You mentioned just a minute ago that you are aware of some reproduction problems experienced by one mink rancher 60 miles north of Columbus.

Does that mink rancher feed Great Lakes fish to his mink?

A I do not know.

Q Did you form, on the basis of your conversation with him, any conclusions about why he is experiencing reproductive problems?

A I could not answer his problem.

Q So insofar as your knowledge today is concerned we can write off PCBs as the cause of those reproductive problems.

A Based on the information that I had been given over the telephone.

Q You were asked some questions about Dr. Veith's participation in your 1980 report to EPA on the effects of 1016 on the mink.

Did you provide Dr. Veith with drafts of that report before it was finalized?

I am not referring to your 1976 report. I am referring to the one that is the 1980.

Isn't it 1980?

MR. WHITE: 2-B, this one.

BY MR. FEATHERSTONE:

Q Which is now Exhibit 2-B to your deposition.

MR. WHITE: Do you understand the question?

THE WITNESS: Could I have the question.

BY MR. FEATHERSTONE:

Q In view of all of this, let me restate it.

You are looking at Exhibit 2-B, which is your 1980 report to EPA on the effects of Aroclor 1016 on mink.

A Yes.

Q The Project Officer identified, as pointed out by Miss Oliver, is Dr. Veith. My question is, did you submit to Dr. Veith or any people working with him drafts of that report which is now Exhibit 2-B?

A Yes, prior to it being published.

Q Did Dr. Veith make comments on your earlier drafts?

A Someone made a few editorial changes. Beyond that, to my knowledge, I don't recall.

Q The editorial changes were shipped back to you on a draft form, is that correct?

A I believe that is correct.

Q Did you submit more than one draft to Dr. Veith?

A I certainly do not recall.

Q About how long a period of time was involved in the exchange that went on between you and your office and EPA on the drafting of what is now Exhibit 2-B?

A It was a considerable time, but I do not recall. It may have been a year or more before it was finally published.

Q Is it fair to say that in that year or more period that there was several drafts that went back and forth between you and the EPA?

A I know of at least one, but I don't know beyond that point.

Q Did you speak on the telephone with Dr. Veith or anybody reporting to him about your study which is now Exhibit 2-B before it was published?

A Yes. Inquiry as to when and if it was ever going to be published.

Q Any discussion of the results?

A No.

Q Do you have someplace in your office the draft that you submitted to EPA and received back with revisions and comments?

A Probably do.

Q As Ms. Oliver would say, would you please give that to Mr. White for us.

A I will. Will photocopies suffice?

Q Photocopies are fine, with the understanding that the comments, and sometimes these are sketchy comments, can be deciphered by us back here in Chicago.

A I will do so.

Q Do you have any written communications with Dr. Veith or anybody at EPA on this draft? I mean, perhaps the comment came back in typed form as an attachment or letter form.

A I will also supply any correspondence.

Q Terrific.

A To Mr. White.

Q While we are on that subject, was there

anybody else at EPA with whom you dealt, other than Dr. Veith, or somebody in his office, on this, what is now Exhibit 2-B to your deposition?

A Not to my knowledge.

Q Going back for a second to your 1976 report on 10-16, which is Attachment F to your affidavit of 1976, did you have any correspondence with people at US EPA about this study after it was finalized, or while it was in the preparation phase?

THE WITNESS: Can I have that back, please.

(The record was read by the reporter.)

BY THE WITNESS:

A I do not recall.

BY MR. FEATHERSTONE:

Q Would you --

A I would be willing to check my files.

Q Search your files. Thank you. I would make the same request that I made in connection with the other exhibit, which is Exhibit 2-B.

Doctor, yesterday in response to some of my questions you testified about some papers that are being prepared by this European exchange student

whom we have never identified. Is he preparing two papers?

A In a letter of correspondence from him he indicated that he would be preparing probably two papers.

Q When you testified yesterday that there were a couple of papers in preparation, and I labeled them papers one and papers two, are papers one and papers two these papers that are being prepared by this European exchange student?

A Yes.

Q You testified in response to Ms. Oliver's questions that the papers concern hormone circulation in mink.

A Yes.

Q Are these hormones that affect the reproduction, growth or survival of mink?

A Yes, they do.

Q So I take it that the report or papers whenever issued will contain the results of tests which will deal in some respect with the effect of PCBs on the reproduction, growth, and survival of mink?

A In that circulating hormones affect reproduction and growth, yes.

Q Will the papers draw any conclusions about the reproduction, growth and survival of mink, or will the conclusions of the papers be directed toward the effect on the hormones themselves?

A The main thrust will be the effect on the hormones themselves.

Q I take it any conclusions then about the effect of PCBs on the reproduction, growth or survival would be inferentially drawn from whatever results or conclusions you report on the hormone level.

A Yes.

Q Do you intend to draw any conclusions as to growth, survival or reproduction of mink as a result of these testings and papers?

A I have to look the data over before that is determined.

Q Your name is going to be on the papers.

A Yes, it will.

Q Doctor, you have also testified that, and

I think you termed it a proposal, of Dr. Hook to look at the effect of PCB on enzyme induction in mink, is that correct?

A We have discussed this. It has not come to -- or the group has discussed this, but it has not come to any fruition.

Q I apologize if this was asked of you earlier, but who is Dr. Hook?

A He is the Director of our Toxicology Center at Michigan State University, and he is a pharmacologist and a toxicologist.

Q I take it the purpose of this -- strike that.

Since it's not even in a formal stage, I won't call it purpose. But I take it that one of the reasons to look at the effect of PCBs on enzyme induction in mink is to get an idea about how PCBs on mink might affect the reproduction of mink.

A And growth, reproduction and growth.

Q How long a time period of study would this be? Has there been any discussion of that?

A No.

Q I take it from your testimony then it's in

a very preliminary stage of discussion.

A Very.

Q Now, you testified, Doctor, that you could not recall any of the substance or topics of your conversation with Mr. Papageorge of Monsanto. Do you recall any conversations with anyone at Monsanto?

A That is the only person, to my knowledge, that I have contacted relative to PCBs and our mink studies.

Q Fine.

You testified that you received certain Aroclors from Monsanto. I take it you requested the Aroclors from Monsanto.

A That is correct.

Q If I understand your testimony in response to Miss Oliver's questions, you requested the Aroclors in writing?

A I believe that to be the case.

Q You did this sometime in the early 1970s?

A To the best of my recollection.

Q At the time that you requested the Aroclors from Monsanto I take it you told Monsanto that it was for research purposes only, on PCBs.

A I presume I would have, but I cannot be sure at this time.

Q Did you request anything else from Monsanto?

A Not to my knowledge.

Q Have you ever requested anything else from Monsanto relating to PCBs?

A No.

MR. WHITE: This is all based upon your recollection at the present time.

THE WITNESS: That is correct.

MS. OLIVER: We have asked the doctor to look at whatever he has.

THE WITNESS: Yes.

MR. WHITE: I don't want Dr. Ringer to have a brainstorm some night.

BY MR. FEATHERSTONE:

Q Dr. Ringer, perhaps I should be clear on this, on the basis of your testimony in the last day or so, but it is a fact that you are not testifying on behalf of any commercial fisherman or commercial fish processors.

A No, I am not.

Q You are certainly not testifying on behalf

of any mink rancher or commercial mink ranching industry.

A No, I am not.

Q Yesterday you testified that the present study at Michigan State University involves the feeding of fishmeal to mink, is that right?

A Yes, I did.

Q In the 1960s, at the time of your first feeding study, I take it mink farmers were not feeding fishmeal to the mink, but rather ground whole fish, is that correct?

A Some may have, but I don't have the knowledge of this.

Q Well, certainly in the late 1960s, as your reports indicated, it was very common practice to feed ground whole fish to mink, as a portion of the diet.

A Yes.

Q I take it there is a difference between fishmeal and ground whole fish.

A In that water has been removed and possibly some other substances along with the water.

Q Well, do you know how the fishmeal is

commercially prepared?

A No, I do not.

Q Do you know whether there is any trimming of the fish that goes on before the fishmeal is prepared?

A No, I do not.

Q From your testimony I take it you don't know what species of fish are used in the preparation of fishmeal.

A No.

Q I take it from your testimony that you don't know where in Lake Michigan, for instance, the fish are caught to prepare the fishmeal.

A I have no knowledge of that.

Q From your testimony that you have not stayed current as to the commercial mink ranching industry in the Great Lakes area, I take it that you are not aware of the profitability of that industry.

A No.

Q In the last ten years.

A No. That is not my area.

Q I take it you don't have any idea as to the effect of the substitution of other products for

Great Lakes fish in the mink diet and the effect of that substitution on the profitability of mink ranching in the Great Lakes area.

A Indirectly I have some knowledge of this.

Q When you say indirrectly, what do you mean?

A Through conversations with other people, and with some representatives from the industry.

Q Well, Doctor, have you ever made a survey to determine the effect of that substitution which I have described on the profitability of mink ranching in the Great Lakes Basin?

A No surveys.

Q You haven't reviewed any literature on that topic, I take it?

A I have not.

Q You haven't reviewed any financial sheets or anything like that.

A No.

Q Is it fair to say that whatever information you do have you believe to be insufficient for you to draw any conclusion about the effect of the substitution on the profitability of mink ranching in the Great Lakes area?

A Other than I know that it costs more to purchase fish from other sources than we could have it made available locally.

Q Do you know that as a fact today?

A In our own experience with running a mink ranch, a research ranch.

Q You also testified yesterday that mink ranchers substituted chicken and other non-fish products for the Great Lakes fish that was eliminated from the diet.

In those instances what was the effect of the substitution on the profitability?

A In some cases the expense would be greater because the cost would be higher for the substitutes.

Q I take it in other cases it wouldn't be so.

A That could be the case.

Q Tell me, Doctor, to what extent was the profitability of mink farms in the Great Lakes Basin affected by the switch from Great Lakes fish to other products?

A I don't feel that I am qualified to get into the exact analysis of costs of mink ranching.

Q Do you have any idea?

MS. JACOBS: You already asked that yesterday, and he said he did not know.

MR. FEATHERSTONE: He can say he does not know again, if that is the case, and I won't belabor the point.

BY THE WITNESS:

A That is not my area of expertise.

BY MR. FEATHERSTONE:

Q So your answer is you don't know?

A I would not render an opinion.

Q Fine.

In the study you produced yesterday there was some testing you did on the European ferret. I hope I am pronouncing that right. Am I?

A Yes, you are.

Q Where is that species located? In other words, do you find it in the Great Lakes area? I mean, I am not trying to be facetious. I have no idea.

A I am not a wildlife biologist.

They are used in research, and we have them at the University, so, yes, they are in the

Great Lakes area.

Q I am sorry. I meant to exclude that. Are they mink, ferrets, are they mink?

A No.

Q What does somebody raise a ferret for?

MR. WHITE: If you know.

BY THE WITNESS:

A People like to have them for hunting.

BY MR. FEATHERSTONE:

Q Are there ferret farms in the Great Lakes area, or ferret ranches?

A In New York State, one in New York State that sells them.

Q Well, are there any that you are aware of who were fed Great Lakes fish in the 1960s and suffered any adverse affects?

A Not, I am not aware of that.

Q That gets rid of my concern about ferrets. I do not know whether they are common in the Great Lakes area or not.

Doctor, is it fair to say that you have no expertise in the area of how and the extent to which Lake Michigan fish absorb PCBs?

A That is not my area.

Q It's likewise fair to say that you don't have any expertise in whether or to what extent Lake Michigan fish swim in and out of Waukegan Harbor?

A That is not my area.

Q Am I correct that you have no idea whether the PCB situation in Waukegan Harbor has had any effect whatsoever on PCB levels in Lake Michigan fish that might be used for mink feeding?

A I have no direct knowledge.

Q Do you have any indirect knowledge?

A Would you repeat the question?

BY MR. FEATHERSTONE:

Q No. I will repeat the question.

Do you have any idea whatsoever whether the PCB situation in Waukegan Harbor has any effect whatsoever on the PCB levels in Lake Michigan fish that might be used or were used as feed for mink?

A That is not -- I do not have that understanding.

Q Now I don't understand where we are. Doctor, let me try it again.

On the basis of your testimony and what

you have read and what you have learned, isn't it true that you have no idea whatsoever whether the PCB situation in Waukegan Harbor has had any effect whatsoever on fish in Lake Michigan?

A I do not have any knowledge on that.

Q Okay. Now, isn't it true that insofar as your knowledge in concerned, you have no idea whether the PCB situation in Waukegan Harbor has had any effect whatsoever on the Lake Michigan fish that were used as feed for mink in the 1960s?

A Since I have no knowledge where the fish were coming from, I would say no.

Q When you say "no," you mean you have no idea?

A I have no idea.

Q Is it also true, Doctor, that you have no idea whether the PCB situation today in Waukegan Harbor has any effect whatsoever on the advisability of using any Lake Michigan fish as feed for mink?

A I have done no research on that Waukegan area, therefore I cannot state that I have direct knowledge.

Q Well, we get to this direct knowledge

again. Do you have any idea?

A I have no knowledge.

Q Now, I am going to ask you the question that I tried to ask you originally. On the basis of your testimony just now, it's fair to say that you have no idea whatsoever whether the PCB situation in Waukegan Harbor in any way contributes to what you say is the inability of mink ranchers to use Lake Michigan fish as feed.

A That would be correct.

Q Let's take the converse of that, Doctor. Isn't it also true that you have no idea whether any dredging of Waukegan Harbor as sought by the Government in this litigation will affect the PCB levels in fish caught and potentially available for use as mink feed?

A That is not my expertise, and therefore I would not render an opinion.

Q Is it likewise true, Doctor, that you have no idea whether any dredging of Waukegan Harbor will in any way make Lake Michigan fish suitable for use as mink feed?

A I have no knowledge.

Q Doctor, are you aware of a gully that runs across the northern property that is owned by Outboard Marine Company in Waukegan Harbor known as the North Ditch?

A Only in perusing the information, I saw there was such a ditch.

Q You saw it ran from the west to the east, and some people claim it ends up in Lake Michigan.

You saw a map.

A I would have to say yes.

Q From your perusing of the material provided you by Mr. White and possibly other Government lawyers, did you learn that there is a claim of the Government that there are PCBs moving out of the ditch and into Lake Michigan?

A That is my understanding.

Q Doctor, do you have any idea whatsoever whether the PCBs that allegedly originate in the north ditch and go into the lake, Lake Michigan, had any effect whatsoever on the mink back in the 1960s, when there were these reported reproductive failures in mink?

A I have no knowledge.

Q Doctor, maybe I can shortcut it. Isn't it true that you have no idea whether any dredging of the north ditch will have -- Strike that. Let's start over again.

Doctor, isn't it true that you have no idea whether any dredging of the north ditch will affect the PCB levels in fish caught in Lake Michigan and potentially available for use as mink feed?

A That is not my area of expertise, and therefore, I would not render an opinion.

Q Just to conclude on the north ditch, I take it that it's also true you have no idea whether any dredging of the north ditch will in any way help make Lake Michigan fish suitable for use as mink feed.

A That is not my area, so I would not render an opinion.

Q Now, when I have asked you these questions about dredging of the north ditch, and dredging of Waukegan Harbor, you understood me to mean dredging to gather up the sediments and PCBs and remove them.

A That is my understanding.

Q Doctor, you testified in response to Ms. Oliver's question that you in some way keep track of the levels of PCBs in fish, is that not so?

A Not as a --

Q That is why I said in some way.

A Yes.

Q Let me rephrase the question.

A That is correct, in some way.

Q Are you familiar with the recent data with respect to the PCB levels in Lake Michigan fish?

A The past month, no.

Q A fair response.

How familiar are you, in other words, what is the most recent data you have seen? I don't want you to describe the data. Just tell me what year.

A I have probably had some reports that I have seen within the last two years. Approximately two years ago.

Q Are these whole fish or fish fillet data?

A I believe they were whole fish.

Q Who gave you these statistics?

A I do not recall at this moment.

Q Was it the Michigan Department of Natural Resources?

A I do not recall.

Q What you recall is that you have seen the data, and the data concerned the PCB levels of Lake Michigan fish within the last two years.

A Because of our interest in that, yes.

Q Which species of fish, Lake Michigan fish?

A I believe I was looking at coho salmon, lake trout, and possibly yellow perch.

Q Why were you interested in those three species?

A They happen to have been species that we have tested.

Q If I understand you, yellow perch, coho salmon and lake trout are potential fish feed sources for mink?

A Since they represent somewhat the top of the food chain within the Great Lakes, yes.

Q Let me ask you this. From the point of view of food source for mink, and put the PCBs aside for a second, are coho salmon, yellow perch, bloater chub, lake trout, and other species of fish pretty much interchangeable? In other words, do they supply the same basic nutrition and protein need that the fish portion of the diet is supposed to provide?

A There are some differences and some care that has to be taken in feeding different fish from the Great Lakes, or from any source.

Q When you say there are some differences, what differences are you referring to?

A Some fish contain thiaminase, which must be destroyed by cooking before they can be fed to mink or you create a thiamine deficiency.

Q So the differences you are talking about are the differences you take into account when you prepare the fish for incorporation into the mink feed.

A That is correct.

Q The care that you talked about is the same thing, the preparation of the fish for use as mink feed.

Q Assuming that proper preparation and care is taken in the treatment of the fish to remove these other things you have talked about, is it then fair to say that basically bloater chub, yellow perch, lake trout, coho salmon and other fish species are interchangeable for use as mink feed?

A They could be.

Q From your point of view as a professor of poultry science and one who has done a lot of work with mink -- I think I have got the right terms.

Let's go back. From your point of view, someone who has done a lot of research on mink, and obviously a lot of work on mink feed, from a practical standpoint are the various species of Lake Michigan fish interchangeable?

A Yes.

Q The recent data that you have seen with respect to coho salmon, what were the levels of PCBs reported?

A As I recall, the values were ranging between I believe two and five, on the latest data. That's parts per million.

Q Parts per million, whole fish?

A Whole fish, I believe.

Q From Lake Michigan, as you testified.

A Yes.

Q The recent figures that you have seen for lake trout pulled from Lake Michigan, what are the PCB levels?

A As I recall, they were within the same range, or possibly even slightly higher.

Q Well, the same range, you mean two to five parts per million?

A Correct.

Q I take it from the way you have testified that your recollection is that the PCB levels in coho salmon and lake trout are roughly the same?

A Basically, yes.

Q What are the recent PCB levels in yellow perch that you have seen?

A As I recall, they were below that, but I would not give any specific value.

Q When you say "below that," you mean below two to five parts per million, whole fish?

A Correct.

Q Yesterday, Doctor, you testified that you thought an acceptable level of PCB in the total mink diet is one part per million, is that correct?

A Based on our present knowledge.

Q You and I had a little conversation. We concluded that if a fish had three parts per million concentration, and that fish was fed as 30 percent of the diet, that would be okay, in your judgment.

A I believe I gave you some qualifications. That one might want to use some care when they were feeding that.

Q I will get to that in a second.

I take it then that coho salmon and the lake trout that had two to three parts per million PCBs would be okay for use as mink feed, provided that the percentage of the mink diet was no more than 30 percent.

A If they bordered on the lower side of the range that I gave you.

Q Let me start over again.

The range you gave me for coho salmon and lake trout was roughly two to five parts per million. I take it if the salmon or lake trout were to amount

to say 15 percent of the mink diet that you could use the coho salmon and lake trout pulled out of Lake Michigan for use as mink feed?

A At certain times of the year I would possibly accept that.

Q Well, you would accept, wouldn't you, that as long as your one part per million total diet PCB level was advisable, that a mink rancher using coho salmon and lake trout today caught in Lake Michigan could use those fish up to 15 percent of the diet.

A My recommendation would certainly be for them to do this with care.

Q You do not remember the parts per million PCB concentration figures that you have seen for yellow perch.

A No, I do not.

Q But I take it you would agree that since your recollection is the yellow perch data was lower than trout or salmon, that a mink rancher has more flexibility to use yellow perch as a mink feed than salmon or trout.

A If the levels were possibly kept down and he fed it with care.

Q Doctor, I have some recent figures.

A Okay.

Q I will accept your recollection on the three species we talked about. I want to talk about one other, another one you tested way back in the late 1960s. It's the bloater chub. Remember you tested that fish as a mink feed back then.

A Yes.

Q In a recent survey tried by no lesser authority than the United States Government, it shows for bloater chub pulled out of Lake Michigan in 1980, and they pulled out a heck of a lot of them, the average PCB concentration was 2.22 parts per million, whole fish.

A Yes.

Q I take it you would agree as long as you are one part per million PCB level total diet is an acceptable level, that a mink rancher could use bloater chub as mink feed certainly up to 30 percent of the diet.

A With care, but I would still probably caution the individual.

Q The caution that you would give would be whether it's appropriate to feed bloater chub

pulled today out of Lake Michian, certain times of the breeding period, I take it?

A I would recommend against, during the breeding season.

Q Let's go to the breeding season for a second.

Earlier in your testimony today in response to my question you said that one part per million PCB level in mink feed was an acceptable level with certain qualifications. That qualification, I told you we will get to it later. We are getting to it now. I take it the qualification is whether that should be used at all during the reproductive season of the mink.

A Or on breeder animals.

Q If I understand your testimony correctly, what you are saying is that it's your opinion that as long as Lake Michigan fish are contaminated with PCB they probably ought not to be used with breeder mink or during the reproduction season.

A I would want to qualify that.

Q Okay. We will get the qualifications. What is the qualification you want?

A I believe you said if it contained any PCB. And if one were talking about parts per trillion or parts per billion, that would still be containing PCB. But I would not render that as being at all dangerous for reproduction in mink.

Q Your math is perhaps a little bit better than mine, but let me ask you the question point blank.

I am a mink rancher, and I come to you, Dr. Ringer, and I say, "Boy, I have looked at the levels of PCBs in fish, and they are declining, and if I use it at 30 percent, if I use the Great Lakes fish as 30 percent of my mink diet, I will be at one part per million of PCB concentration of the total diet."

You come back to me and say, "That is fine, Mr. Featherstone, but don't use it on breeder mink or during the reproductive season."

What level of PCB in Lake Michigan fish is safe, in your judgment, for use on breeder mink, or during the reproduction season?

A If I were to take the extreme of Dr. Platonow's research, he showed that six tenths of

a part per million was damaging to reproduction.

Q Yousaid if. Do you take Dr. Platonow's conclusion?

A It cannot be dismissed. It's scientific information published in the literature.

Q Well, I would say you have artfully dodged my question, but I'm going to be persistent.

What level would you say is safe, what level under one part per million PCB concentration of the total diet would you say is safe for use in breeder mink, or during the reproductive season?

A Can I come back with a qualifying question and ask you continuously or for one week or one day, one month? Because it is a time dosage response, and therefore one must know how long, and the concentration.

Q Doctor, I will respond to that first this way, by saying that sometimes getting your hands on this is like trying to squeeze Jello, and you squeeze it out all over the place.

A I am trying to say it's not a simplistic answer.

Q I understand. Let's break it out. Let's

take this situation.

I am a mink rancher, and I don't have a gas chromatograph or gas chronometer. I don't want to have to call you up every day or call an analytical chemist every day to take a look at my fish feed.

So let's take a day in, day out situation. A mink rancher wants to feed Great Lakes fish to breeder mink or during the reproduction season. What is the safe PCB level in the total diet, first off?

A I would not speculate on an exact level.

Q Well, you would say it's less than one part per million.

A That would be correct.

Q How much less, roughly? I won't hold you, I won't hold you to point two is the safe level, but can you give me a range, or do you not know?

A Except under oath I wouldn't want to specifically say a specific level.

Q So all you are willing to state under oath is that it's somewhere under one part per million.

A Yes.

Q On a day in, day out feeding basis.

A Yes, I would make that statement, to reproducing

animals.

Q Animals meaning mink in this case.

A Correct.

Q So that I am clear with your testimony, what you are not willing to say under oath is how much less than one part per million PCB in the total diet is advisable on a day in, day out feeding schedule.

A Since we have never conducted a research project to see what is the absolute minimum that one could feed, I would not like to speculate on what that level is. It would be just a matter of conjecture if I did give a level.

Q So any range, any range under one part per million PCB total diet you would be unwilling to speculate as to the range of safety, is that right?

Strike that. That is a terrible question. I apologize. I will come back with this question.

I take it that since you are unwilling to speculate, as you call it, as to a safe level less than one part per million total PCB in a diet, you are likewise unwilling to speculate under oath,

as you will call it, as to the range in which that safety would fall under one part per million?

In other words, is it somewhere between point three and point six, or you don't want to speculate about that?

A I would not like to at this point.

Q Doctor, we have discussed your knowledge of the levels of PCBs in Lake Michigan fish. I take it from the data you have seen it's been your observation that PCB levels in Lake Michigan fish declined.

A That is correct.

Q You are also aware that preparation, trimming, that sort, can reduce the PCB levels in a particular portion of the fish lower than what is reported in the whole fish.

A Yes, I am aware of that.

Q Doctor, when I was asking you at what level under one part per million PCB total diet concentration you would recommend for use with breeding mink, you said, you asked me on what basis, and I said assume it's on a day in, day out feeding schedule. That is how you understood those questions?

A Yes.

Q I take it if the feeding were on a more irregular basis, if you will, the mink rancher could safely use a higher PCB level.

A Based on time dosage response, yes.

Q Is it likewise fair to say that with respect to your conclusion that one part per million PCB total diet for mink is safe, with the qualifications that you have made, that if on occasion a mink rancher fed his mink maybe a little bit more than one part per million PCB, it would be all right?

A If then followed by a low level, correct.

Q All you are saying is it has to average out to about one part per million PCB.

A That is correct.

Q So we have some flexibility.

A Yes, of course.

Q I take it that a mink rancher can feed male mink higher PCB levels than female mink, is that correct?

A In that we have not seen an action upon spermatogenesis or sperm formation, yes. But in that if you get high enough to adversely affect the growth or cause mortality, then you have to say no.

Q I understand. What I am going to look for in the next couple of questions is a safe level for male mink, if you will.

I take it you would agree that that safe level in the total diet for male mink, safe level of PCB would be somewhat higher than one part per million.

A Slightly higher, yes.

Q Under oath, Doctor, what is that safe level?

A Again, this would depend on a time dosage study. But I would keep it, and this is an opinion, because we have no exact data to show this, probably below one and a half parts per million.

Q Day in and day out feeding basis for a male mink?

A Yes.

Q At one and a half parts per million total diet PCBs, I take it you could feed the male mink fish containing PCBs in the concentration of 4.5 parts per million whole fish if you assume that 30 percent of the diet was Lake Michigan fish?

A If one were to continue this animal for

let's say four years of age, I would probably go below that.

Q That is a safety factor that you have added on.

A Yes. If it goes to being time dosage response, it depends on the length of that duration with the male.

Q You of course have not conducted a four-year feeding study.

A No, we have never.

Q Doctor, in your conclusion that one point five part per million PCB concentration in the total diet of mink is a safe level for male mink, did you rely on your studies which have shown that two part per million total diet concentration of Aroclor 1242 is a safe level?

A Based on our studies with two parts per million showing that we did get spermatogenesis from the males.

Q All of your answers, Doctor, have been qualified by, "a safe level for breeder mink." I take it by that you are referring to female mink that are raised to breed more mink, is that right?

A Yes.

Q Are there mink ranches that raise female minks for some other purposes, other than breeding?

A For the fur.

Q What do you call those? If you don't call them breeder mink, what do you call them?

A Pelters, I believe.

Q Pelters?

A I believe the industry would call them pelter mink.

Q I take it a lot of mink are raised for pelt purposes.

A Yes.

Q Mink that you raise for purposes of their pelts I take it then could -- Well, strike that.

Let me ask this. At some point down the line you are going to kill the pelters or skin the pelters, is that right?

A Yes, sir.

Q I take it that mink that are bred for pelting purposes can support a somewhat higher level of PCBs in their diet than breeder mink.

A Because of the duration of the feeding.

Mink are born either late April into early May, and they are pelted November-December of that year. They nurse the mother for the first four weeks, approximately, following the May birth. So they are only fed solid food between June and November-December.

Q Then they are killed, the pelts are taken.

A Yes. So that you understand, I wanted to state why.

Q We are talking about a six month period of time.

A Roughly a six month period of time.

Q During the six month period of time in which pelters are fed, what is a safe level of PCB in their diet?

A The only caution I have to give here is -- or one of the cautions I have to give here is that they may carry some of these over as their breeders, if they haven't identified them early in the year, and that creates a caution that one must issue.

Q You still, however, have not answered my

question.

A It would be, I would probably take the same approximate level that I mentioned for the male, one point five parts per million of Aroclor, of the Aroclors 1242, -48, -54.

Q Is it fair to say that a mink rancher has a little more flexibility in terms of exceeding that one point five parts per million level for pelters than he does for male mink that are kept around as -- I don't think it's the word stud, but let's call it studding purposes.

A Breeding purposes.

Q Breeding purposes.

A If he realized the risk he was taking by going too high. His check would, of course, be growth and mortality.

Q I take it that for the pelters, pelters could certainly be fed up to 30 percent of their diet with bloater chubs, given the 2.22 parts per million PCB concentration in the whole bloater chub pulled out of Lake Michigan, as reported by the U.S. Government.

A I would think as long as the rancher knew

the risk he was taking.

Q That is not much of a risk, is it, Doctor?

A There is always some.

Q Well, 2.22 parts per million PCB spread in 30 percent of the diet comes out to about --

A Point seven.

Q -- point seven parts per million PCB.

A Roughly.

Q Is that correct?

A Yes.

Q That is about one-half of the safe level that you have given --

A Right.

Q -- you have given here for pelters.

A And a safety factor of two could be conceived by some as being risky.

Q Doctor, I have a lingering question about this new Michigan State breeding study. I have many questions, but the only lingering one that can be resolved here is this one.

You testified that the purpose of the feeding study was to determine the effect of the commercial fishmeal on the mink.

A On the growth and reproduction of the mink.

Q I take it that it was your conclusion, the conclusion of the people working this project, that you couldn't adequately predict that by scanning the fishmeal for the PCB level in the fishmeal.

A That is correct.

Q Why is that?

A First we did not know what the levels of the fishmeal that we would get supplied, what they would be.

Q What PCB levels would be.

A Right.

Q What I am asking is say that your group ran out to a local commercial fish processor, got fishmeal, came back. You could have analyzed that meal for its PCB content, right?

A Yes.

Q You could have taken whatever the level was and said, "Well, if we fed it as 30 percent of the mink diet, that would result in this level of PCB concentration in the total diet," correct?

A Right.

Q Well, you decided not to do that, though.

A That would be an educated guess, and we --

Q An educated guess based on?

A On scientific knowledge.

Q But based on the PCB feeding test that you had done in the past.

A Previous studies, yes.

Q It was decided that the best information was the information that would be obtaining by feeding the fishmeal to the mink, is that correct?

A The original goal of the project, though, was to really look at techniques for rendering the product to remove PCBs. But the granting agency did not want us to pursue that.

Q This is the Michigan Sea Grant?

A Correct.

Q In your judgment are there means readily available to reduce the PCB content in fishmeal, that is commercially available?

A We had ideas and thoughts that it could be removed. Since we have previous reported work showing that extraction procedures would remove the substance.

Q Are these extraction procedures that would

be used by the -- Strike that.

Are these extraction methods that would be used by the commercial fish processor or by the mink rancher?

A No. By the commercial processor.

Q That idea went by the board, however, and the granting agency gave you a grant to conduct a feeding study using fishmeal on the mink.

A That is correct, as part, at least, to the best of my knowledge.

Q Obviously you and your people thought that was a valuable project.

A Yes.

Q To get back to my original question, which I take it is that you think that the feeding of the fishmeal to the mink and observing the results of that test is a more valid, if you will, testing procedure than taking the fishmeal, determining what levels of PCB are in it, and then extrapolating, if you will, to what the result might be.

A Of course, yes. A direct study is always better than speculation.

Q In the context that you have been testifying in the last two days, a direct study would be

feeding the fish or the fishmeal to the mink, correct?

A And observing the results.

Q An indirect study would be applying the PCBs directly to the diet, and then observing the results.

A Indirect, I understood you to mean, would be analyzing it and then predicting what kind of results you might get, based on analysis for PCBs present in the fish.

Q Okay. I will accept that.

Doctor, do you have your 1977 report in front of you?

A Yes.

Q I asked you yesterday whether you conducted a feeding study after the late 1960s. I believe your testimony was yes, and you directed me to a table, I believe it was Table 3 in your 1977 study.

A At some time I did direct you to that study. I don't remember exactly when.

Q Well, what I want to know is did you conduct a feeding study with Lake Michigan fish after the feeding studies that were conducted in the late 1960s?

A Yes.

Q Where is that study shown?

This is where I think you directed me to Table 3 yesterday. Does Table 3 show that study?

A This is the use of Lake Michigan coho salmon in these two diets, Diet II and Diet III, as given in Table 3 of that publication.

Q We are on Page 283 of your 1977 paper, is that correct?

A Correct.

Q This study that is shown in Table 3, was this a feeding study conducted after 1970?

A Yes.

Q It says used coho salmon. Was that coho salmon that was caught in the late 1960s, and frozen, and used for this later study?

A The question was caught in 1970?

Q No. Let me start over.

A Or late 1960s?

Q Table 3 on Page 283 of the 1977 study shows feeding studies that you say was conducted after the late 1960s. My question is the fish used in that feeding study, were those fish caught in the late 1960s and preserved until later?

A In that we had several supplies, I believe

this was new fish.

Q New fish caught when?

A It would be in the early 1970s.

Q The reason I ask this, Doctor, is somewhere in some of your other studies, and unfortunately I couldn't find it this morning, I saw a statement in which you said the coho salmon used in the various feeding studies that you undertook were caught between 1967 and 1970. 1970 is the final year.

A You could not point me to that?

Q Right now I could not. I am representing that as -- Does that refresh your recollection that the coho salmon that you used were caught in that timespan, 1967 to 1970?

A No, it does not refresh my memory. That is why I was asking.

Q Can you tell from any place in this 1977 paper what year you would have caught that coho salmon that is reflected in the tests that are shown in Table 3?

A From this publication I cannot tell, but I think that I am sure that information is available.

Q Have you published that information anyplace?

A You are saying other than in this 1977 publication?

Q I thought we just decided you nowhere in that 1977 publication state when you caught the coho salmon that was used in the feeding study that is reported there.

A It very well could be reported to the Michigan -- let me correct that -- to the Mink Farmers Research Foundation, which we report annually, and they have supported, as I indicated to you yesterday, some of our studies. There is a very good likelihood it's reported to them, and it would be by the year.

Q All right. But I am talking about the published papers that I can get my hands on, as somebody interested in your research. Do you know of any place in your published papers where you have stated in what years you caught the coho salmon that were used in the feeding study that was shown in Table 3 on Page 283 of your 1977 report?

The reason I ask that, Doctor, is that I couldn't find it anyplace. The only statement I did see was a statement that I described to you

earlier where you stated that your coho salmon were all caught in the time period 1967 to 1970.

A Unfortunately, I do not see that date given in this 1977 publication, which was a review of data collected up until that time. I am sure it's available.

Q Before we get to where it might be available, Doctor, the fish -- strike that.

The mink feeding study that is shown in Table 3 on Page 283 of the 1977 paper, had that been reported in any of your previous papers?

A A quick perusal and recollection indicates that it had not been.

Q I take it you have someplace in your laboratory data on when you caught the coho salmon that are reported on Table 3 of the 1977 paper?

A Yes.

Q You would be happy enough to provide it to Mr. White?

A Yes, I will.

Q I see you are reading it, Doctor. I read it, and I couldn't find it. We tried to do this a little bit yesterday, and we didn't get anywhere

then either.

A My understanding is you would like me to supply then Mr. White with the date that the coho salmon were caught that we used in the study on Table 3 of the 1977 publication.

Q Yes. With the understanding that Table 3 in the 1977 paper reports the only coho salmon -- strike that.

With the understanding that Table 3 in the 1977 paper reports the only mink feeding study done with coho salmon since the feeding studies that you did back in the late 1960s.

A I should supply him with any other information.

Q Yes, if you have it. Because yesterday you testified that the mink feeding study reported in Table 3 in your 1977 paper was the only feeding study with coho salmon that you had done since the late 1960s.

A My recollection was you asked a question whether we had ever done any studies after the 1968 to 1970, and I so indicated yes we did, and cited this as one example.

Q Okay.

A At least one example.

Q Let's get this squared away first.

What I would like for Table 3 in your 1977 report are the dates, years are fine, on which you took coho salmon from Lake Michigan that you used in the study of this report on Table 3.

Off the record.

(Discussion had off the record.)

BY MR. FEATHERSTONE:

Q Doctor, other than the mink feeding study that used coho salmon reported in Table 3 of your 1977 paper, what other feeding studies did you conduct after the feeding studies that were done in the late 1960s?

A I would have to go through all these publications to check that.

Q I am talking about studies -- When I say feeding studies, I am talking about studies in which you fed fish to the mink, as opposed to adding the Aroclors directly to the diet.

A Great Lakes fish.

Q Yes, Great Lakes fish. Lake Michigan fish would be my first choice, but you always identified it as Great Lakes fish.

A Yes. They were always specified, if it was not Lake Michigan fish.

Q Could we do it this way, Doctor, and Jim, please interject if you don't think this is appropriate. Rather than taking the time here in Chicago to go through all these papers, when you go back to Lansing, would you sit down and list the feeding studies that you did with mink that used Great Lakes fish or Lake Michigan fish, and that took place after the late 1960s. And for those studies, I'd like to know in what years you caught the fish that were used. I also would like to know the species of the fish, too. Is that okay?

A Yes, I will do that.

Q Just so that I am clear, the feeding studies that you did in the late 1960s were shown in that 1971 paper that you published, the very first paper, on the feeding of Great Lakes fish to mink.

A (Indicating.)

Q Yes. The proper title is "Effects of

Feeding Coho Salmon and Other Great Lakes Fish on Mink Reproduction."

A Repeat the question, the point of the question.

Q It would be faster if I just ask the question again.

You are holding the 1971 paper in your hand. My reading of that paper is that you conducted those feeding studies during the period of time roughly 1967 to 1970.

A Correct.

Q I take it the fish used in that feeding study were caught in that period of time.

A Yes, they were.

Q When I say late 1960s feeding studies, I am referring to the one that is shown in your 1971 article. Is that okay, Dr. Ringer?

A Yes.

MR. FEATHERSTONE: Why don't we take a quick break.

(Recess had.)

BY MR. FEATHERSTONE:

Q Doctor, I thought of one thing in reponse

to my request for you to do some work back in your laboratory. This may not involve any additional work, but here is the request. When you look for feeding studies that use Lake Michigan fish, or Great Lakes fish, after the ones that are reported in the 1971 paper, you are going to give me the species, and the year in which the species of the fish were caught.

Would you also provide me with the level of PCB residue in that fish if it's other than in the range of 12 to 20 parts per million, which you have stated is the range for the coho salmon, as you recall it.

A If it is available.

Q Yes, sure. If it is not available, tell me it is not available, and that will be fine.

A I will do that.

Q Doctor, so that I am clear on one additional point, the percentage of a mink diet that might be composed of Great Lakes fish, there is no strict requirement that a certain percentage be used, is that correct?

A That is correct.

Q Reading your 1971 paper, and a few of the papers dated just before that, and also reading between the lines of those reports, percentages were as low as ten percent, fifteen percent sometimes, is that right?

A That is correct.

Q In fact, that was pretty common.

A Yes.

Q It is also fair to say, isn't it, that fish as 30 percent of a mink diet was toward the high side of the range that you would find among mink ranchers.

A As I indicated to you, I know of feeding as high as 65 percent of fish.

Q I know. But that was the European mink rancher, you testified.

A Yes.

Q I am talking about the normal range, the 30 percent of the total diet made up of fish is toward the high side of the range that you have observed among commercial mink ranchers, is that right?

A It is probably on the higher side, yes, but not unusual, not unheard of.

Q Doctor, I have a few questions on this. 9231
Would you look at the study that is in press now called "Excessive Nail Growth in the European Ferret Induced by Aroclor 1242."

A Yes. 3-B.

Q 3-B, right, in Exhibit 3-B. Would you turn to the last page of the text, which is Page 6. Would you read the last paragraph to yourself, Doctor.

A (After examining document.) Yes.

Q Doctor, in that paragraph you write that the abnormal toenail development that you observed might be attributable to contaminants in Aroclor 1242 as opposed to Aroclor 1016, or a greater number of the certain isomers of PCB and 1242 as opposed to those in Aroclor 1016, or indeed the positioning of chlorines on the biphenyl ring in 1242 as opposed to 1016.

Is that right, as a paraphrase?

A That is correct.

Q You have citations for each of those ideas in that paragraph.

A Yes.

Q I take it that your research that is reported

in this paper didn't shed any light on which of these three, if any of them, might be responsible for the abnormal toenail development.

A That is correct.

Q Is it fair to say that the three reasons you throw out here in the last paragraph are pretty much speculation on your part?

A That is correct. None of them may actually cause it.

Q Doctor, would you turn to your 1980 report that was published in the Archives of Environmental, Contamination and Toxicology, it is entitled, "Polychlorinated Biphenyls (Aroclors 1016 and 1242): Effects on Survival and Reproduction in Mink and Ferrets." I just have a couple of questions.

A Yes.

Q Would you flip to Page 629.

A I have it.

Q I use this by way of example only. If you would look at the first full paragraph beginning, "All mink that died. . . "

A Yes.

Q At the beginning of the third sentence which

starts at the end of the third line refers to gastric ulcers. I have seen that written in some other reports of yours. What is the significance of a gastric ulcer that you reported observing in the mink?

A One of the symptoms that we observed when we fed the 30 parts per million Aroclor in our original study with the mixture of Aroclors, and we have observed when we fed the high levels or the 30 percent byproduct of the coho salmon, one of the symptoms was bloody stools, bloody fecal, droppings from these animals, described as a tarry-like mass, indicating blood being present in the feces that has now been changed in its nature. It is not fresh red blood.

Q Is it dry blood?

A It is blood that has come generally down through a portion of the digestive tract and been changed.

Q Well, is that a result of gastric ulcers?

A And the finding has been that these have been coming from gastric ulcers. The bleeding has been coming from gastric ulcers.

Q Have you determined in your studies that

the gastric ulcers that you have observed were caused by the PCBs fed the mink?

A One cannot directly speculate that, since the animals just prior to death show, as stated there, showed anorexia, weakness, and often lethargy. They do not eat. And the gastric ulcers could be partially attributed to a reduced feed intake.

Q So in other words, you have not concluded the gastric ulcers are a result of PCB feeding, or PCB ingestion by the mink.

A In that we are assuming that the reduced food consumption is the result of PCB ingestion, then they are the result of it. But as a specific diagnostic tool or a diagnostic sign, we cannot say that.

Is that clear?

Q That is clear, thank you.

Would you turn to Page 632 of the same report. Please read to yourself the fourth paragraph on that page under the heading, Discussion. The fourth paragraph begins, "If it is assumed. . . " Do you see that?

A Yes.

(After examining document.) Yes, I have read it.

Q Doctor, please correct me if I am wrong, but does that paragraph say that for the LD_{50} test that you ran, or that you calculated, that it takes more of the higher chlorinated compound to kill the female mink than the lower?

A This does not specify anything other than 1242.

Q Well, would you tell me what that paragraph means. I am puzzled over it, and I don't understand it.

Let me ask this question. If I am wrong, then I will let you explain it, because then I am really lost.

Does that paragraph say that the LD_{50} level for a greater concentration of Aroclor 1242 is higher than the LD_{50} level for a lower concentration of Aroclor 1242?

A This is not a specific determination of a LD_{50}, as you might be commonly construing, where there is a single, one dosage.

Q This is an LD_{50} test.

A Based on feeding.

Q Over an extended period of time.

A Over an extended period of time, yes.

Q The point was to calculate the LD_{50} level as a result of this extended feeding study, if you will.

A The point of this was to show at what point and how much per kilogram of body weight had been consumed at the time on a specific level, 50 percent of the animals had died.

Q If I read this paragraph correctly, what you found was it took more than twice as much Aroclor 1242 when it was fed in 40 parts per million concentrations than it took of the same Aroclor when fed at ten parts per million concentration, is that right?

A That is the finding.

Q What is the explanation for that? Do you have one?

A The only expanation that we could give for this difference is that it may indicate differential absorption of the PCB mixture from the gut.

Q If I understand you correctly, what

that would mean is that when you feed greater concentrations of Aroclor 1242 it's less readily absorbed than if you fed it at lower concentrations.

A That is a possibility.

Q Is that what you meant by your answer, though?

A That is, yes, that is an interpretation.

Q Have you been able to reconcile that with your findings on Aroclor 1242, that a higher concentration has much more quick and adverse affects on reproduction, growth and survival than a lower concentration of 1242?

THE WITNESS: Would you read that back to me.

(The record was read by the reporter.)

BY THE WITNESS:

A Yes, it does.

BY MR. FEATHERSTONE:

Q My question was, have you been able to reconcile that, the one finding with the other, and you said yes, it does, and I don't understand that.

In other words, Doctor, your answer seems

to suggest that you didn't understand my question, or you weren't responding to my question.

A I apparently, even on rereading, because you were conversing, and that disrupted my thought --

Q Let me try it again. The observation that is reported in this fourth paragraph on Page 632, have you been able to reconcile that with your findings in the Aroclor 1242 feeding study that the higher concentration of Aroclor 1242 when fed to the mink caused quicker and more adverse effects on reproduction, growth, and survival than you find when you feed Aroclor 1242 at a lower concentration?

A If you are inferring that 40 in contrast to 10, which is four-fold, and the figures given there being two-fold increase, therefore yes, I would say that one could reconcile that. One is a four-fold, and one is a two-fold. Therefore twice as much has still got in. Therefore, mortality and reproduction shouldn't be more quickly influenced.

Q Well, I wasn't focusing on four-fold and two-fold.

A Except that is the data.

Q No. What I am trying to understand is

whether you can reconcile your interpretation of Paragraph 4 on Page 632 with your interpretation and the results you observed in the feeding study. In particular, I am interested in the following: You concluded or testified that a valid reading of Paragraph 4 on Page 632 is that it takes much more Aroclor 1242 when it's fed in concentrations of 40 parts per million to hit this LD_{50} level than it does when you feed Aroclor 1242 in lower concentrations, such as 10 parts per million, is that right?

A That is correct. That is the result of the experiment, yes.

Q That's right. That is the result of the LD_{50} experiment.

A Yes.

Q Let's go over to this other feeding experiment where you looked at the growth, reproduction and survival. It is fair --

A This is survival.

Q Let's go to reproduction and growth. Okay?

A Except the 40 parts per million did not live to reproduce, therefore, I can't make a judgment

on reproduction.

Q What about 20 parts per million?

A They didn't.

Q Did they all die?

A They all died.

Q Let's forget it. I am not going to get an answer.

The last page, Page 634, would you read the last paragraph, the last paragraph of your paper. In other words, the only complete paragraph.

A (After examining document.) Yes.

Q Doctor, in that paragraph you set forth some thoughts you have on what might explain the difference in toxicity between Aroclor 1016 and the other PCB mixtures, is that right?

A That is correct.

Q Is it fair to say that you have thrown out in that paragraph a whole number of explanations, possible explanations?

A There are several.

Q Doctor, is it also fair to say that your study which is reported here sheds no light on which of those explanations might explain what you found?

A That is correct.

Q Indeed isn't it also fair to say, Doctor, that the true explanation might be something that is not even shown in that paragraph.

A That is always possible.

Q Doctor, would you turn to what is now marked Exhibit 3-C, which bears the title "Biological Effects of PCBs and PBBs on Mink and Ferrets - A Review," written by you and two others.

A Yes.

Q The first page under the heading Abstract, the second paragraph, the third sentence, do you see that?

A Yes.

Q "The dietary concentration . . . " Would you read that sentence to yourself.

"The dietary concentration lethal to 50 percent of the adult mink was calculated as 8.6 and 6.65 ppm for Aroclors 1242 and 1254, respectively."

A That is correct.

Q What does that mean?

A One would have to read the paper, I believe, to interpret that.

Q Well, can you interpret that for me right now?

A In a rather simplistic manner. If one would take the --

Q Doctor, let me try it in my words, and tell me if I am wrong.

A All right.

Q Does that mean that in the LD_{50} test that you ran for Aroclors 1242 and 1254 it took less 1254 than 1242?

A This is talking about the concentration in the diet.

Q That's right.

A Based upon a mathematical computation.

Q Yes. Does it mean what I asked?

A That it would take a lower level of Aroclor 1254 than Aroclor 1242 to be lethal to 50 percent of the mink if fed over the same course of time.

Q What course of time?

A Well, that's spelled out in the document here as being basically over 247 to 313 days.

Q Over that time period you found it took less of a concentration of 1254 --

A I am sorry. Two hundred forty-seven to 297 days.

Q Okay. This sentence on Page 1 means that over that period you just set out the lethal dose involves less of a concentration of 1254 than it does of 1242.

A The lethal concentration in the diet.

Q With that modification, is that what that means?

A I have to go back and --

Q Okay. You know where I am coming from. Now tell me what that sentence on Page 1 means, the sentence beginning, "The dietary concentration lethal to 50 percent of the adult mink was calculated as 8.6 and 6.65 parts per million for Aroclors 1242 and 1254, respectively."

A It says that it would take a lower concentration fed continually in the diet of 1254 to kill 50 percent of your mink than it would of Aroclor 1242.

Q In other words, 1254 is more lethal than 1242 over that period.

A That is an interpretation, yes, based upon

the concentration.

Q If you reduced the period of feeding, what would happen to the lethality of the Aroclors?

A I have no basis.

Q You have no idea?

A I have no basis to arrive at a conclusion.

Q Doctor, do you have in front of you the testimony that you gave in the Bethlehem Mink case?

A Yes, I do.

Q Would you turn to Page 20, please.

A I have it.

Q Would you read that page to yourself. Just skim it. I will direct your attention to something moe specific. I just want to put it --

MR. WHITE: It starts here (indicating).

BY THE WITNESS:

A Do you want me to go to Page 21?

BY MR. FEATHERSTONE:

Q No. The deal will be, Doctor, if you can't answer one of my questions, feel free to refer to before or after the portion I direct your attention to, please.

The testimony that appears on Page 20

relates to the feeding studies that you ran in the late 1960s, is that correct?

A That is correct.

Q The testing, the analytical testing that is referred to on Page 20 also relates to the study that was done in the late 1960s by yourself.

A Yes.

Q Doctor, refer down the page, and I will read the questions and answers I want to ask you about.

"QUESTION: At that initial point in time, were they analyzed for PCBs?

"ANSWER: No, they were not."

That question and answer refers to what you did in the 1960s during that feeding study, that is, you did not analyze those fish for PCB content, is that correct?

A That is correct.

Q The next question and answer, Doctor, reads as follows:

"QUESTION: Was that something that there was widespread knowledge of in 1968?"

Let me stop there. When you heard that

question and responded to it, you understood the questioner to be asking you whether there was widespread knowledge of the PCBs in fish in 1968, is that correct?

A In the Great Lakes.

Q In the Great Lakes.

A That is correct.

Q Your answer, Doctor, reads:

"ANSWER: PCBs were known, but they were not known, and it was not widespread knowledge for the presence, certainly not in coho salmon."

Doctor, when you got involved in your feeding studies in the late 1960s to determine what it was in the Great Lakes fish that was causing the problem, did you read up on the literature about coho salmon somewhat?

A I knew what -- I know what coho salmon -- what they were at the time.

Q Did you read up to find out in the literature what had been reported as levels of contaminants, and what types of contaminants were being found in the coho salmon?

A We had our own analyses done for this study.

Q I am talking about prior to the time you had your own analytical work done, did you take a look at the literature?

A I presume we were appraised of this by some of the colleagues that were working on the project.

Q Well, you certainly looked at Hartsough's work, right? You looked at his work, right?

A Yes.

Q Which had been done in 1965.

A That was not research.

Q What was it?

A That's observation, reports. He's a veterinarian that services the mink industry.

Q I take it you looked at his report, Dr. Hartsough's, before getting involved in this feeding study that you described in the late 1960s, is that right?

A I was familiar with it, yes.

Q Did you look at other types of things written on coho salmon, or on the feeding of Great Lakes fish to mink, that type of thing?

A What I am trying to say, research is a

team effort, and there were fish experts on the team that was doing that study.

Q So there were people who did it, but it wasn't you, is that what you are saying? There were people who took a look at the literature, who were involved in your project and reported back to you.

A And probably reported to us or presented us with the information.

Q Okay.

A Yes.

Q Page 20, where the answer is:

"PCBs were known, but they were not known, and it was not widespread knowledge for the presence, certainly not in coho salmon."

I take it what you are saying is it was not known by you, and it wasn't, insofar as you know, known by others that PCBs were in coho salmon in 1967 or 1968, is that correct?

A It was at least not called to my attention.

Q The answer that you gave that I just read you, that is what you meant when you answered that question, is that correct?

A That is correct.

MR. FEATHERSTONE: No further questions.

Oh, yes I do.

BY MR. FEATHERSTONE:

Q Doctor, you said you had some EPA grant money.

A Yes.

Q Two grants, that you recall.

A Yes.

Q One grant I take it was used to do this Aroclor 1016 study that is attached as Attachment F to your 1976 affidavit.

A Which is part of 2-B, if that is the exact number.

Q Let me rephrase it this way.

One of your EPA grants of money was used, and the results are Attachment F to your 1967 affidavit, and what is now Exhibit 2-B, which you wrote in final form in 1980.

A Yes, one of them.

Q What was the second grant used for?

A Also probably for a portion of the same study, to support it.

Q The Aroclor 1016.

A Yes.

Q Have you received any other monies from the Federal Government in your PCB work, any agency?

A Are you saying -- I am supported also by USDA funds.

Q Okay.

A As a member of the University.

Q Does that money come directly to you for your research activities?

A Some of it does. Some comes to my colleagues, too, that are part of the team working on this. Specifically whether dollars might be used on this, we don't delineate, we don't delineate a clearcut; this is for this research, exactly.

Q But in any event, you received two EPA grants of money for your Aroclor 1016 research, is that right?

A Yes.

Q You have also received from time to time monies directly from the USDA for research.

A For research, correct.

Q Your colleagues have also received monies from USDA for research in which you were involved.

A That is correct.

Q For how long have you been receiving USDA research money?

A Without an exact record, I presume I have probably gotten it since I have been at Michigan State University, since 1957.

Q Let's get away from PCBs for a second with respect to your government grant money.

You had done work with a variety of other chemicals as well.

A Yes.

Q Has any of that work been sponsored by the Government, paid for by any Government agency?

A I may have gotten some money to help support, I am not absolutely sure of this, some work done back in the very early 1960s from the Department of Interior, the U.S. Department of Interior.

Q Other than that, can you recall any?

A Now, this is on chemicals --

Q Any of your research work since 1957.

A I am supported in the training of graduate students through HEW funds, fellowship training. I have had several.

Q Is that ongoing today?

A Yes.

Q For how long have you been supported in that endeavor by HEW funds?

A It's been periodically off and on over a course of time.

Q When you say "over a course of time," over a course of a long time, I take it?

A Yes. None of them have ever worked on this research.

Q I understand that. Any other sources of federal money that either support your research activities or your teaching activities, or any of your professional life?

A I believe that's all.

Q The Michigan Sea Grant of money that you referred to, those are federal monies, aren't they?

A Yes, they are.

Q Have you had Michigan Sea Grants other than this last one that you refer to?

A Yes.

Q How often have you had Michigan Sea Grants?

A Over several years.

Q Beginning when?

A Approximately five years.

Q The last five years.

A That would be a recollection.

Q The Sea Grant project was created about five years ago, wasn't it?

A Yes. When Michigan State University moved into it, I did obtain one the very first year, yes. That was in support of PCB work.

Q What did you use it for?

MR. WHITE: It was.

BY MR. FEATHERSTONE:

Q It was?

A It was in support.

Q Was?

A It was.

Q It was in support?

A Was, yes.

Q What did you use it for?

A Some of the Aroclor 1242 was supported for that.

Q Have you ever done any work with Dr. Humphrey of the Michigan Department of Public Health?

A I know him, but we have not collaborated on research.

Q Have you ever spoken to him?

A Yes.

Q Have you spoken to him about your research?

A I probably have.

Q Do you remember doing that?

A No, not as a specific.

Q Have you ever been in written communication with Dr. Humphrey?

A I have great doubt of that, since he's --

Q Located in Lansing.

A Yes.

Q When is the last time you had any contact with Dr. Humphrey?

MR. WHITE: A long time ago?

BY THE WITNESS:

A I may have seen him at a meeting this past year. I believe I did see him.

BY MR. FEATHERSTONE:

Q Let me rephrase the question to ask you when is the last time you had a conversation of substance with Dr. Humphrey?

A Three years ago, probably.

Q Was it about PCBs?

A I believe we were at a meeting together, and it was probably on PBBs.

Q Howabout Dr. Kimbrough, do you know her?

A Yes, I do.

Q Have you had any written communications with Dr. Kimbrough?

A I may have. Mostly it's been by telephone.

Q When you talk to people like Dr. Kimbrough or Dr. Humphrey by telephone, do you make notes of those calls?

A Yes, and they are probably thrown away or done on scrap paper that is near the phone.

Q Do you ever have those notes typed up, or do you ever keep them?

A No.

Q I have a request to add to your list. Would you make available to Mr. White for us communications you have had with Dr. Kimbrough, written communications, on PCBs?

A Yes, I will.

Q These communications that you have had

with Dr. Kimbrough, have they been about your work, her work, or both?

A It has been related to the mink studies. I have also consulted with her on PBB studies.

Q As it relates to your findings in mink, I take it.

A Yes.

Q Have you had any communications with Dr. Nesbitt?

A Not to my knowledge.

Q Do you know who Dr. Nesbitt is?

A Yes, I do.

Q I asked you earlier about your communications with Dr. Veith.

A Yes.

Q Have you had any communications with him other than in connection with this draft of the 1980 report on Aroclor 1016 that I asked you about earlier?

A Most of our communications have been via telephone.

Q Yes.

A And in the original setting up of the

grants, we did communicate. But it would be related to the 1016 research.

Q Have you talked to Veith at all about Waukegan Harbor?

A No, I have not.

Q Have you talked to any experts about Waukegan Harbor or Lake Michigan with respect to the PCB situation in Waukegan Harbor?

A No, I have not.

Q Do you have any plans to do so?

A Not to my knowledge right now.

Q Do you know a Dr. Colby?

A Yes, I do.

Q Have you had any written communication with him?

A I do not believe so.

Q Have you ever spoken to him by telephone?

A We appeared on a press.

Q Panel?

A Press interview together. We have been together, several times, on the PBB episode.

Q A press interview relating to what?

A PCBs, associated with the American Chemical

Society meeting at which the data that you have on the 1972 report --

Q Did Dr. Colby make any comments during that press interview about your work?

A I don't recall whether he did or did not.

Q Was that press interview ever transcribed?

A I don't have a copy.

Q Did you ever see any statements you made during that press interview appear in any newspapers or anything?

A No.

Q Doctor, do you keep a file of your clippings, if you will, articles in which you have been quoted, things of that nature?

A Yes.

Q Doctor, I have one more thing I want you to add to your list. I would like your press clippings file.

Does that also include magazine articles, and that type of thing?

A Popular press.

Q Popular press?

A Yes. I don't have many, but I have a few.

Q Okay.

A Now, you only want them related to PCBs. You don't want them on such things as aortic rupture in turkeys.

Q No.

A That is totally unrelated.

Q PCBs. To make it clear, anything relating to your late 1960s studies on the feeding of coho salmon and other Great Lakes fish to mink, in which you didn't even know about PCBs, but it has some relevancy to all of this, I think. I don't concede that. For purposes of argument.

Do you know what I'm talking about?

A Eliminate PBBs?

Q Yes, -- well --

MS. OLIVER: I don't know.

BY MR. FEATHERSTONE:

Q For my purposes you can eliminate PBBs, unless you are asked to compare PBBs with PCBs, okay?

Roseanne, if you have got a different request, go ahead and make it. You can make it now.

MS. OLIVER: I would like to see the PBB ones as well.

BY THE WITNESS:

A I will send these to Mr. White.

MR. WHITE: Yes. We will discuss this at some length and we will --

BY MR. FEATHERSTONE:

Q You don't have any objection to producing those to us, do you?

A No.

Q Doctor, do you have any objection to producing any of the material that I have asked for during the deposition?

A Not if available.

Q Or that Ms. Oliver's asked for in the deposition?

A Not as long as they are available.

Q If it becomes a cost problem in Xeroxing, let us know, we will pay for it.

A Okay.

Q I want to make sure that I am not going to hear about all these problems later.

Doctor, my last request concerned popular press quotations and things of that nature. I mean, it's broader than newspaper articles. Is that all

right? I mean, you understand it's broader than newspaper quotations. If you were quoted in Sports Illustrated, for instance, about these things.

A Yes. I may not have those.

Q You were in fact quoted in Sports Illustrated, is that right?

A No.

Q There was an article -- Well, never mind.

A In the Reader's Digest, I believe.

Q Do you have those in your file?

A No.

Q You were quoted in Reader's Digest?

A I believe so.

Q Was this a telephone interview with you?

A With my colleague, I think.

Q Dr. Aulerich?

A Probably.

Q Do you have a file of quotations that he's made in the popular press, statements he has made?

A I don't know whether he has one or not.

Q You don't keep one --

A No, certainly I don't.

Q -- of comments made by him about the work

the two of you have done?

A If my name is associated, he probably would give it to me.

MR. FEATHERSTONE: I don't have any further questions.

MS. OLIVER: I have a few here.

REDIRECT EXAMINATION

BY MS. OLIVER:

Q In responding to some of Mr. Featherstone's questions you talked about feeding of fish day in, day out, or on another basis. Do you know what the practice in the mink industry was in the 1960s with respect to feeding fish in the diet of mink?

A It's generally a pretty consistent thing. They make up a large -- They make it in large batches, depending on the size of the commercial operation, and then that is fed out -- frozen and then thawed out, and fed out as required.

Q So to your knowledge the practice in the industry has been to include fish in the diet of mink on a day in, day out basis, pretty much regularly.

A Yes, yes.

Q That practice hasn't changed, to your

knowledge?

A No. They stay close to that.

Q I have a couple of questions on the breeder, pelter thing.

You mentioned that pelters are kept or raised for about six months, and then their skins are taken.

What is the life expectancy for a breeder mink?

A A normal figure that I continually hear quoted is somewhere between four and five years.

Q To your knowledge has that life expectancy changed over the last 20 years?

A I have no knowledge one way or another.

Q You haven't done any kind of survey?

A No.

Q Am I correct that in the mink ranch industry some of the ranchers raise mink as breeders and pelters, both?

A They maintain their own breeding stock, yes, taken from the offspring that are born.

Q Is that typical, that a mink ranch would maintain its own breeding stock?

A Yes. He may buy additional breeders to upgrade his herd.

Q Am I correct that the purpose of a mink ranch is to raise mink for pelters?

A That is correct.

Q So the breeding stock that is kept is a small part of that, of the number of mink that are on a ranch?

A Since the average figure I quoted you yesterday is they would like to have about four young born per breeding female, they have to have roughly 25 percent of their animals being breeders.

Q So am I correct in understanding that about 25 percent of the mink in the Lake Michigan area are mink breeders, and the remainder are pelters?

A I think that is a fair assumption.

Q The problems that you reported arising in 1967 with mink reproduction, do you know if the problems were observed in the mink breeders?

A Only.

Q Only?

A To our knowledge.

Q Were the problems that were reported only related to reproduction problems?

A That is correct.

Q There were no problems reported back in the late 1960s regarding growth?

A I think there is a good explanation of why it was not in growth.

Q But first answer my question, that it was --

A There were no problems.

Q Reported.

A Reported on growth.

Q Now you are going to tell me why.

A The availability of the coho salmon that brought this to a crux took place late, after the spawning run, and the growth of the animals had already taken place; therefore, the first feeding of the coho salmon took place in their breeders, starting roughly December through the March feeding period of time.

Q Now, this problem that was reported in 1967 during the breeding period, was that problem reported before the 1967 breeding period?

A Complications from feeding Great Lakes

fish had been reported prior to that time.

Q When?

A Dr. Hartsough reported that this problem had been existing starting in I believe he stated mid- to early-1960s. But without reviewing that article, I would not want to be held for those exact dates.

Q So your information as to previous problems with reproduction are based on Dr. Hartsough's article that you reviewed?

A That is correct.

Q Are all the tests and experiments you have conducted on minks been conducted on minks, research minks from the Michigan State mink ranch?

A Yes.

Q No one, to your knowledge, ever tested any of the mink breeders that were reported to have had problems reproducing in 1967?

MS. JACOBS: Tests for what purposes?

BY MS. OLIVER:

Q Tested to find out what the problem was.

A I would imagine that people did examine that problem. I did not.

Q You did not --

A No.

Q -- test any of the mink that were in the mink industry who reportedly had any problems in the 1967 reproduction breeding period?

A To my knowledge no one at Michigan State University did.

Q Do you know of anyone who did?

A I would have suspected that the companies supplying the feed did.

Q But you haven't read or heard of any such studies?

A No.

Q Since 1967 do you have knowledge of any studies or tests that have been done on mink commercially raised?

A "For" the question is?

Q For reproductive problems, growth problems, survival problems.

A We continually get phone calls about problems.

Q But I am asking whether any studies have been done of commercially raised mink with respect to reproduction.

A We have looked at problems on the growth of the young, which might have been suspected to have something to do with lactation.

Q Were those studies that you had done, done on mink that were on a mink ranch in the commercial sphere?

A At least in one case I would say yes.

Q What was that?

A We were asked to go out and look and see whether the animals had anemia, in Iowa.

Q Did you find the cause of their problem?

A No.

Q So you didn't relate those to PCBs in any way.

A No.

Q Do you know of any studies that have been done on mink in the commercial area that have been raised, that have had any problems which have been related to PCBs?

A The case I testified in in the Bethlehem case was such a case.

Q Anything else?

A There are other cases, but I have not

appeared in them.

Q Anything in the Lake Michigan area?

A Possibly. You know, the Lake Michigan area. Immediately adjacent to it, no.

Q What areas are you referring to when you say adjacent to it?

A I believe one of my colleagues was involved in Minnesota.

Q Was it found to be a PCB problem?

A I think that is what the suspect was. I am not sure what the outcome was.

Q Any others that you are aware of?

A I believe that's the only one.

Q If I could just make sure I understand.

Is it your testimony, Dr. Ringer, that the only two instances in which commercially raised mink have been studied and found or suspected to have a PCB related problems was in the Bethlehem mink farm in New Hampshire, and the Minnesota mink farm?

A I am not sure whether the Minnesota mink farm actually turned out to be that problem.

Q But those are the two areas which are even suspected, to your knowledge?

A No. There are others that have been suspected.

Q But not in the Great Lakes.

A But not due to the Great Lakes, yes.

Q Does your group have a practice of issuing press releases relating to the work that has been done, or any kind of public releases?

MR. WHITE: By "his group," you are talking about Michigan State University?

MS. OLIVER: His research group.

BY THE WITNESS:

A I make no effort to get publicity on our research.

BY MS. OLIVER:

Q So to your knowledge there are no press releases available on your various reports or tests or studies?

A Not as of the present, no.

Q Well, for any of the past reports.

A I will supply anything.

Q If you have them, you could add that to the list.

A That would be included.

Q Press clippings.

A That is where we get -- Yes, I have that written down. They have a clipping service. If our information service releases anything, they send us a copy of it.

MS. OLIVER: I don't have anything else. Thank you.

MR. WHITE: I have a few questions just for points of clarification.

CROSS EXAMINATION

BY MR. WHITE:

Q Yesterday when Mr. Featherstone was examining you, you testified, I believe, that the Great Lakes fish had two parts per million. Based on an average consumption of fish, it was safe for human consumption.

A That is correct.

Q Is there any qualification to that statement, or that piece of testimony?

A Yes.

MR. FEATHERSTONE: Objection, leading.

BY MR. WHITE:

Q Go ahead and answer.

A Yes.

Q What is the qualification?

A The thing we had been talking about, and I was directing my response to, was the effect upon reproduction, the ability of the human to conceive, carry a fetus to term, and to lactate or nurse the infant.

As I specified in my answer on another question, I was not talking about effects upon any biochemistry or such as enzyme induction.

Q So the safe level of two parts per million, is it possible for that safe level to change if the parameter would change, that is, reproduction or lactating females, would the two parts per million change, possibly?

MR. FEATHERSTONE: Objection, leading, and no foundation.

BY THE WITNESS:

A Can you repeat --

BY MR. WHITE:

Q Do you want me to rephrase it?

A Yes.

Q Fine. Two parts per million, I believe your

testimony is two parts per million is a safe level for human consumption for an average fish eater of Great Lakes fish.

A Yes.

Q Is it your testimony that that two part per million may go up or down, depending upon the parameters, that is, depending upon whether or not it has some other parameters, other than lactating female or pregnant women.

MR. FEATHERSTONE: Objection, no foundation.

BY THE WITNESS:

A That is correct, because as I just stated a few moments ago in the question about our mink research, talking about a specific level, I indicated that such things as enzyme induction could be induced, or you could induce hepatic enzymes at levels below what we were talking about for reproduction. My discourse primarily intended to be directed at reproduction.

BY MR. WHITE:

Q With respect to Exhibit 2-B, Doctor, Page 1, the sentence in the second paragraph that Mr. Featherstone had you review, I believe your testimony

was that --

MR. FEATHERSTONE: I don't want to steal Miss Oliver's thunder, but that was her question.

MS. OLIVER: I know we look a lot alike. It is easy to confuse us.

BY MR. WHITE:

Q In your prior testimony, Doctor, you indicated under questioning by Miss Oliver or Mr. Featherstone that that was your opinion, that PCBs would create a hazard, or would present a hazard for many years to come. I believe your testimony was that that was based upon your studies, is that correct?

A I believe that is correct.

Q When you say your studies, what I am looking for is a clarification of that word. Does that only include your mink studies, the experiments that you have done?

A No. This would certainly include reviewing of literature and being as cognizant of what is going on in the area as possible. Scientific literature, and what is being done by other researchers.

Q Doctor, is that statement that PCBs will

present a hazard for many years to come limited only to mink?

A It is probably not just limited to mink.

Q Fine. Thank you.

Doctor, yesterday I believe Mr. Featherstone was questioning you with respect to changes in articles submitted to journals for publication, but prior to publication, and whether or not you had made any such changes, added footnotes or changed the substance of paragraphs. I believe your testimony was to the best of your recollection you had not.

For the purpose of clarification of the record, please explain precisely what is the procedure when you have performed an experiment, and then desired to publish an article in a journal. What are the professional requirements prior to publication as a professor at Michigan State University?

MR. FEATHERSTONE: I object to the form of the question. It is unclear. I object to the foundation.

Are you asking the man what the practice of the profession is or what his personal practice is?

BY MR. WHITE:

Q Do you understand the question, Doctor? Let me rephrase it.

When you perform a study or an experiment, mink feeding experiement such as you have testified to in the last couple of days, prior to publishing that in any journal, what steps and procedures must be gone through for you as a professional at Michigan State University?

A Our normal procedure within our department at Michigan State University has been that we write a manuscript for publication. Before it can leave the department to get attached to it a journal article number, if it is going to a referee journal, such as you would see on the bottom here. I just happened to pick up the article here in 1977. There is a footnote attached that it is published with the approval of Michigan Agriculture Experiment Station as Journal Article No. 7778, in this particular case.

Before it will be approved by the Director of Agriculture Experiment Station, it had been reviewed by two peers and accepted for publication

by these two peers. These would be scientists either within the department, or it could be outside of the department.

The article then goes to the Director for his approval.

Then it is forwarded to a journal, to the editor. The editor then sends it out for peer review by other scientists. Normally two such reviewers. It is then sent back to the authors for the comments of these scientists, which they can either accept or reject those comments. If they do not accept them, our standard procedure is to write to the editor stating why we did not accept the comment of the reviewers,as the editor has so listed to us.

The editor then has the prerogative of rejecting, still rejecting the article or sending it back saying you should do this.

Q During the course of this peer review proceed on campus at Michigan State, and after sending it to the editor of the journal, have the comments that have ever been sent back by your peers at Michigan State, or by the referees for

the journal resulted in your making any changes to any of the articles that you have sent in, or sent to be published?

A Frequently they are editorial changes. So each time the manuscript has to be retyped completely.

Occasionally they will look at something and say why didn't you do this, or interpret it this way.

We either accept or reject those comments.

MR. WHITE: Fine. Thank you. I have no questions.

MR. FEATHERSTONE: Before I go into my questions, Mr. White, let me ask you again for the Government's position on this witness. Is this witness going to be offered at trial, or used at trial to give any testimony on the likely effects or possible effects of PCB exposure to humans?

I will refer you to your description of Dr. Ringer as a witness. There is no mention of that.

MR. WHITE: I think the description of

Dr. Ringer would stand, at this particular point in time. I think that's basically what we are going to offer him for.

I just want the record to reflect the clarifications in the testimony.

MR. FEATHERSTONE: I am not challenging your clarifications. What I am asking is whether you are going to elicit testimony from the good doctor about --

MR. WHITE: We are going to elicit testimony from the doctor with respect to the statement description, brief description of his testimony that was provided to you. That is going to be the basis of his testimony.

MR. FEATHERSTONE: On the basis of that continued representation, Doctor, I have a few questions to ask.

REDIRECT EXAMINATION

BY MR. FEATHERSTONE:

Q When you said that two parts per million PCB was a safe level for humans eating fish, you said average consumption. What is average consumption?

A There are heavy fish eaters, there are

low fish eaters. Some have to be average.

Q What is an average annual consumption of fish that would result in a safe two parts per million PCB level as far as you are concerned?

A I would take the figure as somewheres in the 14, 12 - 14 pounds per year consumption.

Q What is the basis of that, Doctor?

A From what I have read in previous times.

Q Are you aware of any studies in which anyone has found that heavy fish eaters, as you describe them, have been in any way harmed by eating fish containing PCB residue?

A I do not know of any such findings.

Q Doctor, do you follow the epidemilogical work done in the PCB area?

A Only in that it comes to light in some of the material I am reading.

Q Are you aware of any epidemilogical study in which anyone has found any adverse effects from PCB exposure on humans?

A Since I have never made a concerted effort to find it, no.

Q What you are telling me is to the extent

you are familiar with it, you don't know of any epidemilogical study that has found any adverse effects on humans, is that right?

A You are speaking of Great Lakes fish consumption, aren't you? You are not speaking about accidental contamination.

Q Doctor, let me make it very, very clear. Let's take Great Lakes fish first. Are you aware of anybody who has found any adverse effects on humans, eating any quantity of Lake Michigan fish, or any Great Lakes fish with PCB residue in it?

A That is not my expertise, and therefore I don't search that out.

Q So you haven't found anything, is that right?

A That is correct.

Q You just told me it's not your expertise, you don't bother with that literature, is that right?

A But you can't help but read it once in awhile.

Q But you don't follow it.

A I don't make a concerted effort, right.

Q Now, let's go on to any chronic PCB

exposure. Are you aware of anybody anywhere who has found any type of chronic PCB exposure harmful to humans?

A The Yusho case.

Q Do you consider that a chronic exposure case?

A That was more than one meal.

Q My question is, do you consider that a chronic exposure case?

He is talking about the Yusho case, Y-u-s-h-o.

A This depends on how one interprets the word chronic.

Q I am just asking you, do you consider it a chronic exposure case?

A It was not acute, to some of those people. It was certainly not acute exposure.

Q Are you telling me some of the people had chronic exposure?

A Some people term things subacute, subchronic, chronic.

Q Doctor, let's move away from that. Let's go back to the original question. My original question

was are you aware of anybody anyplace who has found any adverse effects to humans from any chronic exposure to PCBs. Your answer was the Yusho incident. Are there any others? We will deal with Yusho in a second. Are there any others?

A No.

Q Let's go to Yusho. Have you read any recent literature on the Yusho incident?

A Recent, no.

Q Have you read any literature by the Japanese medical doctors or the Japanese toxicologists who have analyzed the Yusho victims?

A I don't recall whether I did or did not.

Q Well, Doctor, isn't it a fact that the literature now states that the human effects found in the Yusho victims are attributable to the dibenzo-furan poisoning and not the PCBs?

A I have seen that alluded to.

Q Well, you have seen it more than alluded to. You have seen it stated, haven't you?

MR. WHITE: You know, Bruce, I don't mind you asking Dr. Ringer any questions you want to ask, if I piqued your interest in this area.

I respectfully request the tone of your voice remain as calm and cool as it has in the past, because I am starting to find it insulting.

BY MR. FEATHERSTONE:

Q Doctor, are you all right?

A Yes, sir.

Q Would you please answer my question.

A That is at least one of the current suppositions.

Q You are aware, aren't you, Doctor, that dibenzofurnas have a toxicity level to laboratory animals, certainly, of at least a factor of five greater than PCBs?

A Yes.

Q Are you aware of --

Pardon, Kaye?

MS. JACOBS: It is an admission.

MR. WHITE: Just keep quiet.

Go ahead.

BY MR. FEATHERSTONE:

Q Sorry, Doctor. You are aware, aren't you, Doctor, that the average part per million PCB concentration consumed by the Yusho victims was

at least a thousand parts per million in the rice oil?

A I have seen various figures.

Q The various figures you have seen, have they been around a thousand parts per million?

A They have been high, very high.

Q A lot higher than you --

A I would consider that high.

Q In fact, aren't they so high that you consider this almost an acute poisoning case?

A I am hung up on the term "acute."

Q Well, do you consider it a poisoning case?

A As contrasted to "chronic"?

Q Right.

A If one repeatedly takes something in, it's chronic, in my interpretation.

Q Doctor, have you yourself formed any conclusions about whether dibenzofurans or PCBs caused the problem?

A I was not there, and I have not analyzed any of the compounds; therefore, I cannnot make any judgment.

Q At this point in time, anyway, you don't know

whether it is the dibenzofurans or PCBs or indeed the chlorinated naphthalenes.

A Beyond what I read in the literature.

Q Your understanding of the literature is that it's at best inconclusive, is that your testimony?

A Pardon me?

Q That it is at best inconclusive as to what was the cause in Yusho?

A Since that is not my area of expertise or research, I have not delved directly into that.

Q In other words, you are not willing to express an opinion as to what the current state of the literature is on Yusho.

A No, I am not.

Q Doctor, you are aware that the PCBs that got mixed into the rice oil in Yusho were not Monsanto PCBs?

A That is correct. That is my understanding.

Q I always like to hear that.

A I am well aware of that.

Q You are aware, aren't you, that the chemical mixture of the Japanese PCB involved in that case is different than the Monsanto Aroclor that we are

talking about in this case.

A I am well aware of that.

MR. WHITE: Where does that leave you, Bruce?

MR. FEATHERSTONE: Pardon?

MR. WHITE: I said where does that leave you with respect to finishing up here?

MR. FEATHERSTONE: Well, I think we will get along.

BY MR. FEATHERSTONE:

Q Doctor, is it fair to say then that, as I think you have testified here in the last few minutes, that you just don't keep up on the state of the literature, the state of the art with respect to whether PCBs do or do not cause adverse effects in humans other than on a dermatological basis, or something like that.

A As it would relate to finding effects that we are observing in mink, I would read this --

Q What you are talking about, you follow the literature with respect to the effects of PCBs on human beings only insofar as it concerns human reproductive effects, is that right, or growth?

A That has been the primary emphasis. For example, if I wanted to look at the effect on the toenail of the ferret, I would also look to see how it affects humans. 0283

Q Have you found any studies, any reports by anyone anyplace, anytime, anywhere, that says that PCBs have an adverse effect on human reproduction?

A I will limit it to the United States and say no.

Q When you limit it to the United States I take it you are not aware of anything anyplace else.

A That is correct.

Q Putting Yusho aside, because you and I have already had it out about Yusho, are you aware of any study, any report, anyplace that shows any adverse effects from PCBs on humans, and I am talking about chronic exposure now, that are the adverse effects you saw in mink as a result of your chronic testing?

A Not to my knowledge.

Q Doctor, I want to show you a statement that Roseann Oliver showed you earlier, and Jim

White showed you in his examination, and now I want to show it to you, so therefore the board is complete.

The last sentence of that paragraph that everybody has referred you to -- First of all, the document you hold in your hands doesn't talk about the effects of PCBs on humans, does it?

A It is a general statement.

Q I know. I understand that. But please answer my question first.

The document you hold in your hands right now, which is --

A The report on mink research.

Q Yes. It's Exhibit 2-B.

A That is correct.

Q That document doesn't report anything relating to the effects of PCBs on humans, is that right?

A It is directed at the study on mink.

Q Now, let's go to the sentence I just asked you to read. You said it was a general statement, is that right?

Q Is it a voluntary statement, Doctor? Does it have any relationship to what follows in your report, in Exhibit 2-B?

A The purpose of the study was to look at Aroclor 1016, since 1016 may have been in the environment, and may have got into the fish of the Great Lakes. Therefore, this is what is apropos into the fact that if the Great Lakes fish were contaminated and continued to be contaminated, over the years to come it would have an effect on the mink.

Q Okay. That statement that you are talking about then, the last sentence of the second paragraph on the page labeled Introduction, Page 1 of this Exhibit 2-B, Doctor, doesn't that statement refer to mink?

A It is directed toward mink, but it could also have application elsewhere.

Q I understand that. Let's put that aside.

When you wrote that statement were you writing it to express your opinion on mink only?

A It was an introduction to this article which is dealing with mink. So of course it has

to do with how it applied to mink.

Q Doctor, do you make it a practice to make conclusions, broad, sweeping conclusions on things that you do not stay abreast of?

A I think after questioning you know I do not try to make broad, sweeping statements.

Q Doctor, I would have said that, I think, maybe as well after admitting now under oath that you do not follow all the literature on the effects, or no effects of PCBs on humans.

Will you now say that that sentence that everybody has pointed out to you, the last sentence in the second paragraph on the page labeled Introduction, does not relate to humans?

A I don't know how you can actually say that, since if the human, if it does -- if the compounds do get into fish, and the human eats the fish, how can I totally eliminate the human or any other animal that would eat the fish.

Q What you are saying is there may be an effect. You can't totally eliminate it, but you don't know there is going to be one.

A That is correct.

Q Indeed, as you have stated a number of times

in your deposition, you are not willing to state with any degree of certainty that there will be any effects of any humans eating fish containing PCBs, is that right?

A I have an answer with some qualifications, and I stand by that.

MR. FEATHERSTONE: Roseann.

REDIRECT EXAMINATION

BY MS. OLIVER:

Q Well, I have to ask a couple of questions. When I asked you about the Introduction to your 1980 report, and I asked you whether it was true or not that the hazard that you are referring to in that paragraph, the hazard that you referred to in that paragraph, is related to the hazard to mink, you told me that that was correct. Do you recall that?

A I believe that was my answer.

Q Is that still your answer? That is what you refer to, the hazard to mink?

A Since it is a broad statement, but it is primarily directed at mink.

your intention was in writing it was to direct it to the study you were doing to mink.

A Of course.

Q If you just look a minute to the last paragraph on that page, the second to the last sentence, it begins, "The objective of this study. . . " Do you see that sentence?

A Correct.

Q The end of that sentence talks about, ". . . provide data for evaluating the relative toxicity of this chlorinated hydrocarbon compound." Which is Aroclor 1016, is that right?

A Yes.

Q Are you aware of any work that has been done using the data provided in this report, your Exhibit 2B, which has been used to evaluate the relative toxicity of Aroclor 1016 to any mammal or animal besides mink?

A I am not aware of anyone else's using it.

MS. OLIVER: I don't have anything else.

MR. WHITE: All right. Thanks very much.

(Witness excused.)

(FURTHER DEPONENT SAITH NOT.)

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ILLINOIS
EASTERN DIVISION

THE UNITED STATES OF AMERICA,	)	
	)	
Plaintiff,	)	
	)	
-vs-	)	No. 78 C 1004
	)	
OUTBOARD MARINE CORPORATION and MONSANTO COMPANY,	)	
	)	
	)	
Defendants.	)	

I hereby certify that I have read the foregoing transcript of my deposition given at the time and place aforesaid, consisted of Pages 1 to 293, inclusive, and I do here again subscribe and make oath that the same is a true, correct and complete transcript of my deposition so given as aforesaid, as it now appears.

_____
ROBERT RINGER

SUBSCRIBED AND SWORN TO
before me this ____ day
of _____, A.D. 1981.

_____
Notary Public

STATE OF ILLINOIS)
) SS:
COUNTY OF C O O K)

I, Thea L. Urban, a notary public within and for the County of Cook and State of Illinois, and a certified shorthand reporter of said state, do hereby certify:

That previous to the commence of the examination of Dr. Robert Ringer, he was by me first duly sworn to testify the whole truth concerning the matters herein;

That the foregoing deposition was reported stenographically by me and Jean Korinko Sweeney, both certified shorthand reporters of the State of Illinois, and was thereafter reduced to typewriting under my personal direction;

That the said deposition was taken before us at the times and places specified;

That the reading and signing of said deposition was not waived, and that the said deposition constitutes a true record of the testimony given by said witness;

That no one reporting this deposition is a relative of, or employee or attorney of counsel for,

any of the parties, nor relative or employee of any attorney or counsel for any of the parties hereto, nor interested directly or indirectly in the outcome of this action.

IN WITNESS WHEREOF, I do hereunto set my hand and affix my seal of office at Chicago, Illinois this _____ day of _____, 1981.

_____
Notary Public,
Cook County,
Illinois.

My commission expires:

_____

C.S.R. Certificate No.